Based on the elevated OVA readings obtained in the field, it was decided to drill one of the cistern soil borings to groundwater and collect soil samples. Table 38 shows the analyses of samples collected below 13.5 ft. in soil boring SBC-3. VOCs (51.32 mg/kg) were detected in the samples collected to a depth of 27.0 to 27.5 ft. Groundwater was encountered at 26 ft.

Perched water was encountered at depths of 13 ft. and 12 ft. while drilling SBC-3 and SBC-6.

The results of total metal analyses and EP toxicity analyses conducted on soil samples collected from SBC-1, SBC-2, SBC-3 and SBC-4 are shown in Tables 39-44. In accord with OEPA September 17, 1985 policy guidance, "Clean Levels for Closures", the soil samples were evaluated with the Student's t-test to determine whether metals contamination was found around the cistern. At the 0.01 level of significance, none of the soil samples collected around the cistern could confidently be said to contain metal concentrations significantly greater than background. No soil samples exhibited EP toxicity.

Six soil borings (SB-34, SB-35, SB-36, SB-36A, SB-37 and SB-38) were drilled in and around the HCC process building to define the extent of perched water believed to be migrating to the cistern and associated piping. The soil borings are shown on Drawing No. 1. Perched water was encountered in SB-36, SB-36A, SB-37 and SB-38 between 2.0 to 3.0 ft. Samples of the perched water were collected and submitted for VOC analysis and the results are shown in Table 45. Perched water did not accumulate in boring SB-38 and it could not be sampled. Perched water was not encountered during the drilling of soil borings SB-34 and SB-35. Table 45 shows that VOCs similar to those found in the cistern were detected in the perched water. VOC concentrations were lower in the sample collected in SB-37, the boring furthest from the cistern. No mineral spirits were identified in the perched water samples.

TABLE 38

# CISTERN BORINGS ADDITIONAL SAMPLING DEPTHS ORGANIC ANALYSIS

Sample Location	SBC-3	SBC-3	SBC-3
Sample Number	SS-138	SS-142	SS-143
Sample Depth	5.0-6.5	21.5-22.0	27.0-27.5
Parameter (mg/kg)			
Methylene Chloride	19 (J)	6.1	2.7
Acetone	100	38	16.
2-Butanone (MEK)	46 (J)	22	22
4-Methy1-2-Pentanone (MIK)	LD	LD	4.2
Toluene	120	3.4	2.3
Ethyl Benzene	43	1.0 (J)	0.82 (J)
Xylene	200	5.4	3.3
Total VOCs	528	75.9	51.32
OVA Reading (ppm)	GT 1000	100	GT 1000

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (J) indicates compound identified at a concentration estimated below the detection limit.

TABLE 39

## CISTERN SOIL SAMPLING METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SS-128	SS-133	SS-137	SS-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/kg)				
Arsenic	13	16	16	15
Barium	LD	LD	LD	LD
Cadmium	LD	LD	LD	LD
Chromium	LD	LD	LD	LD
Lead	5.3	7.8	10	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

- LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (S) indicates concentration determined by the method of standard addition.

TABLE 40

## CISTERN SOIL SAMPLING METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/kg)				
Arsenic	17	22	23	21
Barium	96	LD	76	LD
Cadmium	LD	LD	LD	4.1
Chromium	23	12	LD	18
Lead	70	12	21 (S)	15 (S)
Mercury	LD	LD	LD	LD
Selenium	LD	LD	LD	LD
Silver	LD	LD	LD	LD

- 1. LD indicates less than the detection limit. Detection limits are sample specific. Refer to Appendix C for the specific sample detection limit.
- 2. (S) indicates concentration determined by the method of standard addition.

TABLE 41

## CISTERN SOIL SAMPLING METALS ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-132	SSM-136	SSM-140	SSM-147
Sample Depth (ft)	13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
Parameter (mg/kg)				
Arsenic	18	29	19	17
Barium	LD	LD	LD	LD
Cadmium	LD	4.1	5.3	LD
Chromium	16	15	11	12
Lead	9.9 (S)	19 (S)	9 (S)	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	LD	LD	LD	LD

- LD indicates less than the detection limit. Refer to Appendix C for the specific sample detection limit.
- 2. (S) indicates concentration determined by the method of standard addition.

TABLE 42

## CISTERN SOIL SAMPLING EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-128	SSM-133	SSM-137	SSM-144
Sample Depth (ft)	0.5-2.0	0.5-2.0	0.5-2.0	0.5-2.0
Parameter (mg/1)				
Arsenic	LD	LD	LD	LD
Barium	0.24	0.15	0.16	0.23
Cadmium	LD	LD	0.017	LD
Chromium (T)	LD	LD	LD	LD
Lead	LD	LD	LD	LD
Mercury	LD	LD	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

- LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (R) indicates spike sample recovery was not within control limits.

TABLE 43

## CISTERN SOIL SAMPLING EP TOXICITY ANALYSES

Sample Location	SBC-1	SBC-2	SBC-3	SBC-4
Sample Number	SSM-131	SSM-135	SSM-139	SSM-146
Sample Depth (ft)	8.0-9.5	8.0-9.5	8.0-9.5	8.0-9.5
Parameter (mg/l)				
Arsenic	LD	LD	LD	LD
Barium	0.6	LD	0.26	LD
Cadmium	0.011	LD	LD	LD
Chromium (T)	LD	LD	LD	LD
Lead	0.043	LD	LD	LD
Mercury	0.002	0.002	LD	LD
Selenium (R)	LD	LD	LD	LD
Silver	0.01	0.01	0.01	0.01

- LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (R) indicates spike sample recovery was not within control limits.

TABLE 44

## CISTERN SOIL SAMPLING EP TOXICITY ANALYSES

SBC-1	SBC-2	SBC-3	SBC-4
SSM-132	SSM-136	SSM-140	SSM-147
13.0-14.5	13.0-14.5	13.0-14.5	13.0-14.5
LD	LD	LD	LD
LD	LD	0.07	LD
LD	LD	LD	LD
LD	LD	LD	LD
LD	LD	LD	LD
0.005	LD	LD	LD
LD	LD	LD	LD
0.01	0.01	0.01	0.01
	SSM-132 13.0-14.5 LD LD LD LD LD LD LD LD	SSM-132 SSM-136 13.0-14.5 13.0-14.5  LD	SSM-132 SSM-136 SSM-140 13.0-14.5 13.0-14.5  LD L

- LD indicates less than the detection limit. Detection limits are sample specific. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (R) indicates spike sample recovery was not within control limits.

TABLE 45

TETEDN DODING

	CISTERN BORINGS		010
<u>PE</u>	RCHED WATER ORGANIC	ANALYSES	B Voo
		Dro	ress Bloom
Sample Location	SB-36	SB-36A	SB-37
Sample Number	SS-24	SS-27	SS-19
Sample Date	9/18/86	9/18/86	9/18/86
Parameter (mg/1)			
Acetone	220.0	230.0	LD
Methylene Chloride	380.0	460.0	LD
2-Butanone	430.0	420.0	LD
Toluene	24.0	25.0	160.0
Isopropyl Alcohol	LD	30.0 (J)	LD
4-Methyl, 2-Pentanone	36.0 (J)	31.0 (J)	LD
Hexanone	360.0	240.0	LD
Tetrahydrofuran	70.0 (J) <sup>(3)</sup>	LD	LD
TOC	42,000.	38,500	49.9
TOX	49.	68	0.300

- 1. LD indicates less than the detection limit.
- Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
- 3. Result includes the concentration of propyl furan.
- 4. -- indicates parameter was not analyzed.
- J indicates compound identified at a concentration below the detection limit.

Soil samples were also collected during the drilling of soil borings SB-34, SB-35, SB-37 and SB-38. The results of these samples are shown in Table 46. With the exception of a soil sample collected in soil boring SB-38 between 3.5 to 5.0 ft., the samples contained low levels of VOCs. The SB-38 sample collected between 3.5 to 5.0 ft. contained 146 mg/kg total VOCs. However, the deeper sample (12.5 to 13.5 ft.) from this boring contained 1.8 mg/kg total VOCs.

#### 6.7 Neutralization Pits

In April 1986, isopropyl ether was detected in background soil boring SB-14. The boring was relocated and redrilled as discussed in Section 5.0. The occurrence of isopropyl ether was investigated and conversations with plant personnel indicated that isopropyl ether was an acid base compound containing sulfuric acid and phosphoric acid at concentrations of 25% and 15%, respectively. It was also determined that there was a single instance discharge of off-spec isopropyl ether product to the neutralization pits for treatment. Isopropyl ether is not a regulated substance and is not on the Hazardous Substance List (HSL). To verify that there were no other organic chemicals discharged to the neutralization pits, soil samples collected from the pits were analyzed for organic chemicals.

The results of the organic analyses of samples from the neutralization pits are shown in Tables 47 and 48. Concentrations of VOCs, except isopropyl ether, were similar to concentrations detected in background soil sample. Isopropyl ether was detected at 1175 ug/kg at 9.5 to 11.0 ft. in the east neutralization pit and at 60 ug/kg in the west neutralization pit at similar depth.

Samples from soil borings SB-14, SB-43, PH-1 and PH-2-3 were sent to the laboratory for organics analysis to define the extent of the isopropyl ether in the ground and to verify that other organics were not present. The locations of these borings are shown in Drawing No. 1, the laboratory data is shown in Table 49. Other than isopropyl

TABLE 46

#### CISTERN BORINGS

Sample Location	SB-34	SB-35	SB-37	SB-38	SB-38
Sample Number	SS-17	SS-6	SS-22	SS-11	SS-13
Sample Depth (ft)	3.5-5.0	17.5-18.0	12-13.5	3.5-5.0	12.5-13.5
Parameter (mg/kg)					
Methylene Chloride	0.012	0.510	0.074	11 (J)	0.130
Acetone	0.210	0.130	0.230	LD	0.570
2-Butanone	0.013 (J)	0.041 (J)	0.016 (J)	LD	0.170
1,1,1 Trichloroethane	LD	0.110	LD	LD	0.015
Trichloroethylene	LD	0.110	LD	LD	LD
Benzen e	LD	LD	LD	LD	0.013 (J)
4-Methyl-2 Pentanone	LD	0.026 (J)	LD	LD	0.069
Tetrachloroethylene	LD	0.600	LD	LD	0.026
Toluene	LD	0.100	LD	37	0.250
Ethyl Benzene	LD	0.043	LD	16 (J)	0.029
Total Xylenes	LD	0.250	LD	82	0.110
1,1,2-Trichloro					
1,2,2-Trifluoroethane	LD	LD	0.7 (J)	LD	0.400 (J)
Propane, 2-2' Oxybis	LD	LD	LD	LD	0.020 (J)
Total VOCs	0.235	1.92	1.02	146	1.802
OVA Reading (ppm)	100	100	3.5	GT 1000	12

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (J) indicates compound identified at a concentration estimated below the detection limit.

TABLE 47

## WEST NEUTRALIZATION PIT ORGANIC ANALYSES

Sample Location	SB-39 and	SB-40 (1)
Sample Number	SS-122	SS-123
Sample Depth (ft)	4.5-6.0	9.5-11.0
Parameter (ug/kg)		
Methylene Chloride	89	68
Acetone	44	78
Toluene	1 (J)	LD
1,1,2 Trichloro-		
1,2,2 Trifluoroethane	100 (J)	20 (J)
Chloroform	LD	21
Propane, 2,2'-Oxybis		
(isopropyl ether) (3)	LD	60 (J)
Trimethysilanol (3)	LD	6 (J)
Total VOCs	234	253
OVA Readings	-	

- Sample numbers SS-122 and SS-123 were composite samples of soil borings SB-39 and SB-40.
- (J) indicates compound identified at a concentration estimated below the detection limit.
- 3. Compound is not a regulated hazardous chemical.
- 4. (LD) indicates less than the detection limit. Detection limits are sample specific due to concentration samples of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

TABLE 48

## EAST NEUTRALIZATION PIT ORGANIC ANALYSES

				The second second second second		
Sample Location			SB-41 and S	SB-42 (1)		
Sample Number	SS-124	SS-124 RA	SS-124 DUP	SS-124 DUP RA	SS-124 BLANK	SS-126
Sample Depth (ft)	0-3.0	0-3.0	0-3.0	0-3.0	NA	9.5-11.0
Parameter (ug/kg)						
Methylene Chloride	18	12	77	11	29	37
Acetone	38	35	100	32	LD	82
Toluene	15	10	LD	LD	LD	
Trimethylsilanol (2)	10 (J)	10 (J)	40 (J)	9 (J)	LD	60 (J)
1,1,2-Trichloro-						
1,2,2-Trichloroethane	LD	100 (J)	LD	LD	LD	LD
Propane, 2-2'-Oxybis						
(isopropyl ether) (2)	LD	LD	LD	LD	LD	1000 (J)
Total VOCs	81	167	217	52	29	1179
OVA Readings						
						A SECTION OF THE PROPERTY OF T

- 1. Sample numbers SS-124 and SS-126 were composite samples of soil borings SB-41 and SB-42.
- 2. Compound is not a regulated hazardous chemical.
- 3. Surrogate recovery of Toluene-D8 was outside QC limits due to matrix interference of samples SS-124 and SS-124 duplicate. Samples were reanalyzed (SS-124 RA and SS-124 duplicate RA and surrogate recoveries were again outside QC limits due to matrix interference. See "Sail Surrogate Percent Recovery Summary" in Appendix C.
- 4. LD indicates indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.

TABLE 49

#### NEUTRALIZATION PIT AREA ORGANIC ANALYSES

SB-14 SS-117	SB-14	SB-43	DU 1	
CC_117		55 15	PH-1	PH-2&3
	SS-118	SS-114	PH-1	PH-2&3
.0-4.5	4.5-6.0	See Note 1	See Note 2	See Note 2
80	78	12	12	15
85	76	22	24	23
38	27	3 (J)	2 (J)	2 (J)
2000 (J)	2000 (J)	LD	LD	LD
LD	LD	LD	LD	2 (J)
LD	LD	LD	1 (J)	3 (J)
2203	2181	37	38	42
12	9.5			
	80 85 38 2000 (J) LD LD	.0-4.5 4.5-6.0  80 78  85 76  38 27  2000 (J) 2000 (J)  LD LD  LD LD  2203 2181	.0-4.5 4.5-6.0 See Note 1  80 78 12  85 76 22  38 27 3 (J)  2000 (J) 2000 (J) LD  LD LD LD  LD LD  LD LD  2203 2181 37	.0-4.5 4.5-6.0 See Note 1 See Note 2  80 78 12 12  85 76 22 24  38 27 3 (J) 2 (J)  2000 (J) 2000 (J) LD LD  LD LD LD LD LD  LD LD LD LD LD  LD LD LD LD LD

- 1. Samples were collected at 0.5-1.0 feet, 1.5-3.0 feet, 3-4.5 feet and 8-9.5 feet, and composited.
- Sample No. PH-1 is a composite of soil samples collected from 0 to 5.0 feet. Sample No. PH 2-3 is a composite of soil samples collected at PH-2 and PH-3 from 1.5-3.0 feet.
- 3. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 4. (J) indicates compound identified at a concentration estimated below the detection limit.
- 5. (--) indicates parameter not analyzed.

ether, the VOC concentrations in these samples were similar to background. The concentration of isopropyl ether at a depth of 3.0 to 6.0 ft. in soil boring SB-14 was 2000 ug/kg, however, isopropyl ether was not detected in soil boring SB-43. The extent of isopropyl ether in the ground to the north of the neutralization pits is therefore limited to the area between SB-14 and SB-43. The vertical extent of isopropyl ether in the soil is approximately 9.5 to 11 ft.

Results of total metals analyses (Table 50) indicate elevated levels of iron and copper in samples collected from both pits. Iron concentrations ranged from 28,700 to 68,300 mg/kg. Copper concentrations ranged from 26 mg/kg to 657 mg/kg. Concentrations of other metals were similar to those detected in background soil samples.

Two soil samples (PH-1, PH-2-3) were collected to the north of the neutralization pits and analyzed for total metals. The analytical results are shown in Table 51 and are similar to the results of metals analyses on samples collected from the neutralization pits and background soil samples. Samples PH-2 and PH-2-3 were not analyzed for iron, copper or nickel.

#### 6.8 No Free Liquid Container Storage Area

Five soil borings were drilled along the perimeter of the container storage area located to the east of the HCC facility (Drawing No. 1). Samples were collected from the borings for organics and metals analyses. The results of the analyses are shown in Table 52. Groundwater was not encountered in the Well F borehole and Well F was installed in soil boring SB-46.

In general, VOC concentrations decreased with depth in soil borings SB-46, SB-47, SB-49 and in the Well F borehole. Elevated levels of total VOCs (146 mg/kg) were detected at 2 to 3.5 ft. in the Well F borehole, however, OVA readings approached background at appoximately 17.0 ft. The 17 foot depth was not analyzed by the laboratory. Soil samples collected from soil boring SB-46 at 4.5 to

TABLE 50

## NEUTRALIZATION PITS TOTAL METALS ANALYSES

	West Pit			East Pit	
S	B-39 and SB-40 (	1)		SB-41 and SB-42 (	2)
NPS C-1	NPS C-2	NPS C-3	NPS C-4	NPS C-5	NPS C-6
0-3.0	4.5-6.0	9.5-11.0	0-3.0	4.5-6.0	9.5-11.0
16	6.1	9.6	38	14	11
98	55	45	98	54	51
LD	LD	3.4	4.9	LD	LD
26	12	17	LD	38	15
657	41	26	203	110	27
68,300	30,900	39,400	67,600	33,800	28,700
159	29 (+)	17	92 (+)	88 (+)	15 (S)
LD	LD	LD	0.12	LD	LD
LD	LD	35	35	54	30
LD	LD	LD	LD	LD	LD
LD	LD	LD		LD	LD
81	81	88			87
	NPS C-1 0-3.0 16 98 LD 26 657 68,300 159 LD LD	SB-39 and SB-40 (  NPS C-1 0-3.0  16 6.1 98 55 LD LD 26 12 657 41 68,300 30,900 159 29 (+) LD	SB-39 and SB-40 (1)  NPS C-1 NPS C-2 NPS C-3 0-3.0 4.5-6.0 9.5-11.0  16 6.1 9.6 98 55 45 LD LD 3.4 26 12 17 657 41 26 68,300 30,900 39,400 159 29 (+) 17 LD L	NPS C-1   NPS C-2   NPS C-3   NPS C-4	SB-39 and SB-40   (1)   SB-41 and SB-42   (1)

- 1. Sample numbers NPS C-1, NPS C-2, and NPS C-2 were composite samples of soil borings SB-39 and SB-40.
- 2. Sample numbers NPS C-4, NPS C-5, and NPS C-6 were composite samples of soil borings SB-41 and SB-42.
- LD indicates less than the detection limit. For detection limits of a specific sample refer to the laboratory results in Appendix C.
- 4. R indicates that spike sample recovery was not within control limits.
- 5. + indicates that the correlation coefficient for method of standard addition is less than 0.995.
- 6. \* indicates that duplicate analysis areas not within control limits.
- 7. S indicates valve determined by method of standard addition.

TABLE 51

### NEUTRALIZATION PIT AREA METALS ANALYSES

Sample Location	PH-1	PH-3	PH-2 & PH-3
Sample Number	PH-1	PH-3	PH-2-3
Sample Depth	See Note 1	See Note 1	See Note 1
Parameter (mg/kg)			
Arsenic	17	14	21
Barium	59	53	99
Cadmium	7.1	LD	7
Chromium (T)	LD	32 (R)	324 (R)
Lead	44 (R)	20 (*)	72 (S)(*)
Mercury	LD	LD	LD
Selenium, (R)	LD	LD	LD (R)
Silver	LD (R)	9.9	LD
% Solids	84	76	86

- Sample No. PH-1 is a composite of soil samples collected from 0 to 5.0 feet. Sample No. PH-2-3 is a composite of samples from 1.5 to 3.0 ft. at location PH-2 and PH-3. PH-3 is a composite of soil collected from 0 to 1.5 ft.
- 2. LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory results in Appendix C.
- R indicates that spike sample recovery was not within control limits.
- \* indicates that duplicate analysis areas not within control limits.
- 5. (S) indicates determined by method of standard addition. PH-3 is a composite of soil collected from 0 to 1.5 ft.

TABLE 52

## CONTAINER STORAGE AREA ORGANIC ANALYSES

				an 47	CD 47	CD 40	CD 40	CD 40
Sample Location	Boring Well F		SB-46	SB-47	SB-47	SB-48	SB-49	SB-49
Sample Number	55-29	SS-41	SS-45	SS-50	SS-52	SS-60	SS-63	SS-66
Sample Depth (ft)	2.0-3.5	4.5-6.0	21.0-21.4	3.0-4.5	9.0-10.5	16.5-17.0	3.5-5.0	16.5-16.8
Parameter (mg/kg)								
Methylene Chloride	41.0 (J)	51.0	0.051	3.4	2.6	0.017	19.0	0.008
Acetone	LD	LD	0.090	4.0	3.9	0.048	16.0	0.040
Trans-1,2-Dichloroethylene	LD	18.0 (J)	0.080	LD	LD	LD	LD	LD
2-Butanon e	LD	LD	0.038 (J)	4.9	4.9	0.012 (J)	17.0	0.015
4-Methyl-2-Pentanone	LD	LD	LD	LD	LD	LD	LD	0.004 (J)
Toluene	17.0 (J)	230.0	0.081	12.0	LD	0.011	LD	0.006
Ethyl Benzene	9.0 (J)	230.0	0.027	2.7	LD	LD	LD	LD
Total Xylene	79.0 (J)	1800.0	0.220	5.2	LD	LD	LD	LD
Trimethylsilanol	LD	LD	0.030 (J)	LD	LD	0.020 (J)	LD	0.005 (J)
Hexane	LD	LD	0.060 (J)	LD	LD	LD	LD	LD
2-Methyl-Hexane	LD	LD	0.030 (J)	LD	LD	LD	LD	LD
1-Ethy1-4-Methy1 Benzene	LD	LD	LD	LD	LD	LD	30.0 (J)	LD
Total VOCs	146	2329	0.707	32.2	11.4	0.108	82	0.078
OVA Readings	GT 1000	GT 1000	35	340	20	8	200	3.5

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (J) indicates compound identified at a concentration estimated below the detection limit.
- 3. Monitor Well F was installed in Soil Boring SB-46. No water was encountered during the drilling of Boring Well F.
- 4. Surrogate recoveries of Toluene-D8 and Bromofluorobenzene were outside QC limits due to matrix interference. See "Soil Surrogate Percent Recovery Summary" in Appendix C.
- 5. GT indicates greater than.

6.0 ft. showed a total VOC concentration of 2029 mg/kg which declined to 0.707 mg/kg at 21 ft. VOCs in soil samples collected from soil boring SB-47 at 3.0 to 4.5 ft. and 9.0 to 10.5 ft. were 32.2 mg/kg and 11.4 mg/kg, respectively.

VOC concentrations in soil boring SB-48 were at or near the concentrations of the background soil samples. OVA readings showed background over the entire depth (0.5 to 17.0 ft.) of this boring. VOC concentrations in samples collected at boring SB-49 were 82.0 mg/kg and 0.078 mg/kg at depths of 3.5 to 5.0 ft. and 16.5 to 16.8 ft., respectively.

Results of metals analysis of soil samples collected at or near the sample depths collected for organic analyses are shown in Table 53. Concentrations of arsenic, barium, cadmium, selenium and silver were similar to the metals background in soil. Elevated levels of barium, lead, chromium and mercury were detected in soil boring SB-46 at a depth of 4.5 to 6.0 ft. Mercury levels higher than background were detected at 2.0 to 3.5 ft. in samples from the Well F borehole and at 3.0 to 4.5 ft. in soil boring SB-47.

#### 6.9 API Tank Basin Area

Two soil borings were drilled to the east of the containment basin which is located above the API tank and samples were collected for organic and metals analyses. The results of the analyses are shown in Tables 54 and 55. Boring locations are shown on Drawing No. 1.

Concentrations of VOCs detected in samples from soil boring SB-50 were 0.19 mg/kg and 0.115 mg/kg at 3.5 to 5.0 ft. and 12.5 to 13.5 ft., respectively and were similar to those detected in background soil samples. Total VOCs in soil boring SB-51 were 523.3 mg/kg at a depth of 8.0 to 9.5 ft., however, at 16.5 to 17.0 ft., the VOC concentrations decreased to 0.084 mg/kg, similar to background.

TABLE 53

## CONTAINER STORAGE AREA METALS ANALYSES

Sample Location	Well F Boring	SB-46	SB-47	SB-48	SB-49
Sample Number	SS-30	SS-41	SS-50	SS-60	SS-63
Sample Depth (ft)	2.0-3.5	4.5-6.0	3.0-4.5	16.5-17.0	3.5-5.0
Parameter (mg/kg)					
Arsenic (*)	16	12	12(S)	8.8	10
Barium (*)	78	234	80	36	72
Cadmium	LD	4.8	LD	LD	LD
Chromium (T) (R)	15	74	19	15	14
Lead	76	199	136	18	27
Mercury (R)	1.5	0.56	0.13	LD	LD
Selenium	LD	LD	LD	LD	LD
Silver	LD	LD	LD	LD	LD
% Solids	76	72	80	96	83

- 1. (\*) indicates duplicate analysis was not within control limits.
- 2. (R) indicates spike sample recovery was not within control limits.
- 3. (S) indicates concentration determined by method of standard addition.
- LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
- 5. Monitor Well F was installed in soil boring SB-46. No water was encountered during the drilling of Boring Well F.

TABLE 54

#### API TANK AREA

#### ORGANIC ANALYSES

Sa	ample Location	SB-50	SB-50	SB-50	SB-50	SB-51	SB-51	SB-51
Si	ample Number	SS-77	SS-77 Dup.	SS-77 Blank	SS-79	SS-70	SS-70 RA	SS-72
Sa	ample Depth (ft)	3.5-5.0	3.5-5.0	NA	12.5-13.5	8.0-9.5	8.0-9.5	16.5-17.0
Pa	arameter (mg/kg)							
Me	ethylene Chloride	0.034	0.023	0.031	0.018	4.3	4.2	0.016
Ac	cetone	0.150	0.041	0.010	0.044	11.0	10.0	0.027
Te	etrachloroethylene	LD	LD	LD	LD	3.0	3.0	LD
To	oluene	0.006	0.023	0.004(J)	0.037	100.0	110.0	0.024
E	thyl Benzene	LD	LD	LD	LD	55.0	62.0	0.002(J)
X	ylene	LD	LD	LD	LD	350.0	370.0	0.011
1,	,1,1 Trichloroethane	LD	LD	0.006	LD	LD	LD	LD
1,	,1,2 Trichloro-							
	1,2,2 Trichfluoroethane	LD	LD	LD	0.008(J)	LD	LD	LD
Tr	rimethylsilanol	LD	LD	LD	0.008(J)	LD	LD	LD
Tı	rans-1,2 Dichloroethylene	LD	LD	LD	LD	LD	LD	0.004(J)
To	otal VOCs	0.19	0.087	0.051	0.115	523.3	559.2	0.084
01	VA Readings	3.5		-	2.0	400	-	15

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- 2. (J) indicates compound identified at a concentration estimated below the detection limit.
- 3. NA indicates not applicable.
- 4. Dup. indicates duplicate analysis
- 5. -- indicates parameter not analyzed.
- 6. RA indicates reanalysis by the laboratory. The percent difference for toluene was 33% in the laboratory's continuing calibration. The allowable limit is 25%, therefore actual Toluene concentrations may be slightly higher than reported for sample number SS-70 only. Surrogate recovery of Bromofluorobenzene was outside QC limits, due to matrix interference of sample SS-70. Sample number SS-70 was reanalyzed (SS-70RA). Surrogate for SS-70RA was also outside QC limits, due to matrix interference. See "Soil Surrogate Percent Recovery Summary" in Appendix C.

TABLE 55

## API TANK AREA METALS ANALYSES

Sample Location	SB-51
Sample Number	SS-70
Sample Depth (ft)	8.0-9.5
Parameter (mg/kg)	
Arsenic	8.5 (S) (*)
Barium	54 (*)
Cadmium	LD
Chromium (T)	17 (R)
Lead	19
Mercury	LD (R)
Selenium	LD
Silver	LD

#### NOTES:

% Solids

- 1. (\*) indicates duplicate analysis was not within control limits.
- 2. (R) indicates spike sample recovery was not within control limits.

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- (S) indicates concentration determined by method of standard addition.
- LD indicates less than the detection limit. For the detection limit of a specific sample refer to the laboratory results in Appendix C.

Metals analyses on the soil sample showing the highest concentration of organics in soil boring SB-51 showed less than background (Table 55).

#### 6.10 Storm Water Collection System

A schematic of the HCC storm water drainage system is shown in Drawing No. 3. The drainage system discharges at Outfall No. 001. The storm water system was sampled by HCC personnel under EA's guidance in an effort to identify sources of elevated effluent levels of BOD, TOC and COD. Samples of standing water were collected at various points along the storm water collection system during dry weather periods and samples from the outfall were collected during dry and wet weather periods.

Sample COD was measured as the indicator parameter. COD analyses were performed by the HCC laboratory (Tables 56 and 57). Elevated levels of COD were detected in storm water collected from the area of the shipping dock and the east drive main interceptor. In addition, water seeping from the ground around the manhole of the east drive main interceptor and flow into the manhole also contained elevated levels of COD.

The results of Outfall OOl sampling and COD analyses versus flow rates show that there are elevated COD levels (2850 mg/l) under low flow conditions and COD levels decrease as the flow rate increases in wet weather (Table 57).

Visual inspection of the storm water collection system showed the following:

 During dry weather periods, flow was observed from the north-south piping run into the east drive main interceptor manhole.

TABLE 56

#### STORM WATER COLLECTION SYSTEM

COD (mg/1)			
July 2, 1985	September 6, 1985		
260	100		
160	90		
0	200		
4000	GT 6000		
10	50		
GT 6000	GT 6000 <sup>3</sup>		
_	GT 6000 <sup>4</sup>		
_	GT 6000 <sup>5</sup>		
3600	2600		
4	3		
	260 160 0 4000 10 GT 6000  3600		

- 1. GT indicates greater than
- 2. (--) indicates no sample collected
- 3. Sample collected was standing liquid in the East Drive Main Interceptor.
- 4. Sample collected was liquid flow from the inlet of the North-South run at the East Drive Main Interceptor.
- 5. Sample collected was liquid seepage around the inlet of the East-West run at the East Drive Main Interceptor.

TABLE 57

## OUTFALL 001 COD VS. FLOW RATE

<u>Date</u>	Flow Rate (gal/hr)	COD (mg/1)
6/28/85	9	2600
7/5/85	3	4000
7/5/85	180	675
7/9/85	4	2500
7/10/85	3600	0
7/10/85	257	10
7/10/85	95	50
7/11/85	7	1000

- At the east drive main interceptor, there was no flow through the piping interconnecting the interceptor manhole and the API tank. Seepage around the interconnecting piping in the manhole of the east drive main interceptor was observed.
- There was no flow through the east-west piping at the east drive main interceptor during dry weather periods. Seepage around the connection between the piping and the interceptor manhole was observed.

Sampling and laboratory analyses of the OOI outfall was performed by EA and OEPA. The analytical results of analyses are included in Tables 58 and 59. The flow rate at the outfall when OEPA collected its sample is not known and OEPA exceeded its sample holding time. The outfall flow rate when it was sampled by EA in October 1986 was approximately 30 gallons per hour. VOCs were detected in the discharge in samples collected by OEPA and EA.

### 6.11 Groundwater and Surface Water Monitoring Results

All new and existing monitoring wells were sampled by EA in accord with the protocol described in EA's November 1985 report well locations are shown on Drawing No. 1. At the time this report was prepared, three quarterly sampling events were completed. Third quarter sampling of a limited number of wells was conducted in February 1987, pending USEPA and OEPA review of existing data.

Monitoring data for the May 1986 sampling are shown in Tables 60 and 61. The HCC upgradient well is identified as SW-1 which contained acetone (0.014 mg/l) and methylene chloride (0.001 mg/l) at concentrations are less than detected in the laboratory and field blanks.

As shown in Table 60, the highest levels of VOCs were detected at Monitoring Well C (methylene chloride 1300 mg/l). Other organics may be present at lower concentrations, but could not be detected at the

TABLE 58

#### **OUTFALL 001 SAMPLING RESULTS**

Sample Location	Outfall 001	
Sample Number	OP-001	309Ph
Sample Date	10/2/86	
Parameter (ug/1)		
Acetone	11,000	
Methylene Chloride	2,800	
Toluene	560 (J)	
2-Butanone	3,300	
4-Methyl, 2-Pentanone	17,000	
TOC	67.4	200
TOX	1.3	24.6PPm
		4.10

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory results in Appendix C.
- (J) indicates compound identified at a concentration estimated below the detection limit.

TABLE 59

#### STATE ANALYSES

	Chemical (ug/1)	<u>Upstream</u>	Effluent (001 Outfall)	<u>Downstream</u>
	1,1-dichloroethane	KO.8	82.7	3.9
	1,1,1-trichloroethane	6.6	440	20.5
	1,1-dichloroethene	K1.1	16.5	K1.1
1	trans-1,2-dichloroethene	18.5	98.8	21.7
	trichloroethene	1.9	493	8.3
	tetrachloroethene	12.2	38.2	2.1
	vinyl chloride	KO.9	9.9	10.9
	methylene chloride	K2.0	7,272	349
	benzene	KO.7	19.1	K0.7
	ethylbenzene	KO.2	162	0.5
	toluene	0.6	1,779	4.1
	1,2-dichlorobenzene	KO.5	22.7	0.5
	1,3-dichlorobenzene	KO.2	3.6	KO.2
	N-nitrosodiphenylamine	0.3	0.3	0.4
	dimethylphthalate	KO.4	1.8	KO.4
	di-n-butylphthalate	KO.5	0.5	KO.5
	butylbenzylphthalate	KO.3	0.3	KO.3
	bis(2-ethylhexyl)phthalate	1.5	3.8	2.6
	naphthalene	KO.2	2.9	KO.2
	phenanthrene	0.3	0.6	0.6
	phenol	Ko.7	16.0 400	Ko,7

- Grab samples were collected by the Ohio EPA on March 28, 1985, and were analyzed for volatiles and acid and base neutral extractables. All samples exceeded QA/QC holding times. K = less than.
- This table is taken from OEPA's report, "Toxicity Evaluation Report on Surface Water Discharges," dated September 22, 1986, marked "Draft Subject to Revision".

TABLE 60

# GROUNDWATER MONITORING RESULTS ORGANIC ANALYSES MAY 1986 (FIRST QUARTER)

	BkgQ								
Sample Location	SW-1	SW-2 <sup>(3)</sup>	SW-3	SW-4	A	В	B, Duplicate	B, Blank	C
Sample Number	GW-7		GW-5	GW-4	GW-1	GW-2	GW-2	GW-2	GW-3
Sample Date	5/17/86		5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/1)									
Methylene Chloride	0.001 (J)		0.003 (J)	0.042	LD	440.0	490.0	0.010	1300.0
Acetone	0.014		0.020	0.047	LD	92.0	LD	0.056	LD
2-Butanone	LD		LD	0.023	LD	LD	LD	0.013	LD
Toluene	LD		LD	0.005	0.030	LD	LD	0.004 (J)	LD
1,1 Dichloroethane	LD		LD	0.016	0.006	LD	LD	LD	LD
Xylene	LD		LD	LD	0.030	LD	LD	0.002 (J)	LD
Ethyl Benzene	LD		LD	LD	0.005	LD	LD	LD	LD
4-Methy1-2-Pentanone	LD		LD	0.009 (J)	LD	LD	LD	LD	LD
Propane 2,2-0xybis									
(Isopropyl Ether) (4)	LD		LD	0.080 (J)	LD	LD	LD	LD	LD
TOC	2.8		73.9	22.6	1.4	59.8	71.1	1.4	107.0
TOX	0.040		0.270	0.200	0.010	22.0	180.0	LD	120.0
NOTES .			D.M?						12010

- 1. LD indicates less than the detection limit.
- Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
- 3. No sample was collected for analyses because bailer could not be retrieved from well SW-2. Problem was rectified in September 1986 and sample was collected for analyses.
- 4. Propane 2,2' oxybis (isopropyl ether) is not regulated as a hazardous substance.
- 5. (J) indicates compound identified and concentration estimated below the detection limit.

TABLE 61

# GROUNDWATER MONITORING RESULTS INORGANIC ANALYSES MAY 1986 (FIRST QUARTER)

Sample Location Sample Number	SW-1 GW-7	SW-2 <sup>(2)</sup>	SW-3 GW-5	SW-4 GW-4	A GW-1	B GW-2	B, Duplicate GW-2	B, Blank GW-2	C GW-3
Sample Date	5/17/86	-	5/17/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86	5/16/86
Parameter (mg/1)									
Arsenic	LD		LD	LD	LD	LD	LD	LD	LD
Barium	LD		LD	0.210	LD	0.190	0.190	LD	0.100
Cadmium	LD		LD	LD	LD	LD	LD	LD	LD
Chromium	LD		LD	LD	LD	LD	LD	LD	LD
Lead	LD		LD	LD	LD	LD	LD	LD	LD
Mercury	LD		LD	LD	LD	LD	LD	LD	LD
Selenium (3)	LD		LD	LD	LD	LD	LD	LD	LD
Silver	LD		LD	LD	LD	LD	LD	LD	LD
рН	8.05		7.39	7.08	6.20	6.06		6.96	5.78
Conductivity-umohs/cm	3600		9250	4750	8750	6990		5.1	4700

- 1. LD indicates less than the detection limit. Detection limits are provided in the laboratory reports in Appendix C.
- 2. See Note 3, Table 60.
- 3. Spike sample recovery for selenium analysis was not within the control limits.
- 4. -- indicates parameter not analyzed.

detection limit required to identify the concentration of methylene chloride. Methylene chloride concentrations decrease from Well C to Well B, where the concentration was 440 mg/l. In addition to methylene chloride, a sample from Well B also contained acetone (92 mg/l) and a trace level of 1,1-dichloroethane (0.006 mg/l). However, neither acetone nor 1,1-dichloroethane were detected in a duplicate sample collected from Well B. Well SW-4 contained trace levels of methylene chloride (0.042 mg/l) as well as other VOCs. Well A contained no detectable methylene chloride, but did contain low concentrations of toluene (0.03 mg/l), 1,1-dichloroethane (0.016 mg/l), xylene (0.03 mg/l) and ethylbenzene (0.005 mg/l).

Well SW-3 contained acetone and methylene chloride at concentrations of 0.02 mg/l and 0.003 mg/l, respectively which is less than detected in both the field and laboratory blanks.

TOC and TOX values were greater than upgradient values in Wells SW-3, SW-4, Well B and Well C. The groundwater sample collected from Well SW-3, SW-4, Well B and Well C had an odor similar to that produced by anaerobic decomposition of organic matter.

Table 61 shows the inorganic analytical results from the May 1986 sampling. Except for barium, no heavy metals were detected in any of the groundwater samples. Barium was detected in Wells SW-4, Well B, Well B Duplicate and Well C groundwater samples at 0.21 mg/1, 0.19 mg/1, 0.19 mg/1, and 0.1 mg/1, respectively.

The pH of the upgradient well was 8.05. Lower pH values were measured in each of the groundwater samples collected from the downgradient monitor wells. The lowest pH values were detected at Well C (5.78).

Monitoring data for the September/October 1986 sampling are shown in Tables 62 and 63. Upgradient concentrations of methylene chloride and toluene were 0.180 mg/l and 0.002 mg/l, respectively. Samples from Wells B, C, F and G contained elevated levels of VOCs. Wells C,

TABLE 62

# GROUNDWATER MONITORING RESULTS ORGANIC ANALYSES SEPTEMBER/OCTOBER 1986 (SECOND QUARTER)

Sample Location	SW-1	SW-2	SW-3	SW-4	Α	В	С	Ε	F	F, Duplicate	F Blank	G	
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8	
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86	
Parameter (mg/1)													
Methylene Chloride	0.180	0.007	0.100	0.170	0.170	610.0	1500.0	LD	0.047	0.007	LD	270.0	
Toluene	0.002(J)	LD	LD	0.003(J)	0.002(J)	LD	LD	LD	LD	0.006	LD	3.6(J)	
Xylene	LD	LD	LD	LD	LD	LD	LD	LD	0.012	0.017	LD	LD	
1,2 Diethoxyethane	LD	LD	0.020(J)	LD	LD	LD	LD	LD	LD	LD	LD	LD	
1,1 Dichloroethane	LD	LD	LD	0.012	LD	LD	LD	LD	LD	LD	LD	LD	
2-Methyl, 2-Propanol	LD	LD	LD	0.010	LD	LD	LD	LD	LD	LD	LD	LD	
2,2' Propane, Oxybis	LD	LD	LD	0.100	LD	LD	LD	LD	LD	LD	LD	LD	
Vinyl Chloride	LD	LD	LD	LD	LD	LD	LD	LD	0.024	0.030	LD	LD	
Trans, 1,2,-													
Dichloroethylene	LD	LD	LD .	LD	LD	LD	LD	LD	0.240	0.250	LD	LD	
TOC	7.6	20.9	83.8	9.6	1.3	83.8	134.0	4.6	5.5	5.7	1.1	44.5	
TOX	LD	0.022	0.180	0.016	LD	25.0	40.0	0.026	0.170	0.160	0.011	53.0	

- 1. Wells E, F and G were installed in September 1986.
- 2. LD indicates less than the detection limit.
- 3. Isopropyl ether (2-2' Oxybispropane) is not a regulated hazardous chemical.
- 4. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory reports in Appendix C.

TABLE 63

# GROUNDWATER MONITORING RESULTS INORGANIC ANALYSES SEPTEMBER/OCTOBER 1986 (SECOND QUARTER)

Sample Location	SW-1	SW-2	SW-3	SW-4	Α	В	C	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/1)												
Arsenic (1)	LD	LD	LD	LD	LD	0.018	LD	LD	LD	LD	LO	LD
Barium	LD	0.070	LD	LD	LD	0.280	0.090	LD	0.090	0.090	LD	0.140
Cadmium	LD	LD	LD									
Chromium (T)	0.010	0.018	0.012	LD	LD	LD	LD	0.012	0.022	LD	LD	LD
Lead (1) (2)	LD	0.014	.006	LD	0.018	LD	LD	LD	LD	0.010	LD	LD
Mercury	0.001	0.0027	0.0003	0.0006	0.001	0.0009	0.0008	0.0007	0.0005		LD	0.0003
Selenium	LD	LD	(5)	LD	LD	LD						
Silver	LD	LD	LD									
pH	7.12	6.84	7.54	. 7.10	6.32	6.11	5.87	6.37	7.74			6.82
Conductivity-umohs/cm	3000	1350	9500	3500	1400	3250	1700	1750	1800			4000

- 1. Spike sample recovery was not within the control limits.
- 2. Duplicate analysis was not within the control limits.
- NA is not applicable.
- 4. -- indicates parameter not analyzed
- 5. Detection limits are provided in the laboratory reports in Appendix C.
- 6. (S) indicates concentration determined by method of standard addition.

B and G contained methylene chloride at concentrations of 1500 mg/l, 610 mg/l and 270 mg/l, respectively. In addition to methylene chloride, the sample from Well G contained 3.6 mg/l of toluene.

The sample from Well F contained less methylene chloride than the upgradient well. The Well F sample also contained trans, 1,2-dichloroethylene at 0.24 mg/l, vinyl chloride (0.024 mg/l) and xylene (0.012 mg/l). No VOCs were detected at Well E and Well SW-2 contained a trace level of methylene chloride at 0.007 mg/l. The Well SW-4 sample contained low levels of VOCs.

Results of heavy metals analyses, pH and conductivity are shown in Table 63. Cadmium, selenium or silver were not detected in any of the groundwater samples. Monitoring Well B contained 0.018 mg/l of arsenic. No other samples contained arsenic.

Barium was detected in samples from Wells B, C, E and F at concentrations ranging from 0.06 mg/l to 0.028 mg/l. Chromium was detected in samples collected from SW-l (upgradient), SW-2, SW-3, E and F. Concentrations ranged from 0.01 mg/l (SW-1) to 0.022 mg/l (Well F). Lead was detected in samples from Wells SW-2, Well A and the Well F duplicate at concentrations of 0.014 mg/l, 0.018 mg/l and 0.01 mg/l, respectively. Mercury was detected in all groundwater samples, except the Well F duplicate. Concentrations ranged from 0.0003 mg/l in Well G to 0.0027 mg/l in Well SW-2. The concentration of mercury in upgradient groundwater was 0.001 mg/l.

The pH of groundwater samples decreased from upgradient to downgradient with the lowest pH value measured at Well C (5.87).

In addition to the heavy metals, additional inorganic analyses were performed on select groundwater samples collected in September/October 1986. Results of these analyses are shown in Table 64.

TABLE 64

# GROUNDWATER MONITORING RESULTS INORGANIC ANALYSES SEPTEMBER/OCTOBER 1986

Sample Location	SW-1	SW-2	SW-3	SW-4	A	В	С	E	F	F, Duplicate	F Blank	G
Sample Number	GW-1	GW-9	GW-2	GW-4	GW-3	GW-5	GW-6	GW-10	GW-7	GW-7	GW-7	GW-8
Sample Date	9/20/86	10/1/86	9/20/86	9/20/86	9/20/86	9/21/86	9/21/86	10/2/86	10/1/86	10/1/86	10/1/86	10/1/86
Parameter (mg/1)												
Copper	0.037	0.488	0.025					0.074	0.023	0.031	0.023	0.028
Iron	1.2	19.60	0.200					23.8	0.580	0.670	LD	
Nicke1	LD	LD	LD					LD	LD	LD	LD	0.179
Manganese		6.720						2.420	0.068	0.062	LD	3.580
Zinc		1.230						0.367	0.054	0.052	0.041	2.340
Chlori de	16.0	84.0	330.0					530.0	170.0	170.0	LD	490.0
Fluoride	0.7	0.30	0.20					0.2	0.80	0.70	LD	0.70
Phosphorus (T)	LD	0.20	LD					LD	LD	LD	LD	LD
Sulfate	480.0	93.0	2200.0					135.0	77.0	75.0	LD	142.0

- 1. LD indicates less than the detection limit.
- 2. -- indicates parameter was not analyzed.
- 3. Refer to laboratory results in Appendix C for detection limits.

Copper was detected at concentrations greater than upgradient (0.037 mg/l) in samples from Wells SW-2 (0.488 mg/l) and Well E (0.074 mg/l). Concentrations of iron in samples from Wells SW-2 and E (19.6 mg/l) and 23.8 mg/l) were greater than upgradient concentrations (1.2 mg/l). Nickel was detected in Well G at 0.179 mg/l. No nickel was detected in the upgradient groundwater sample.

Samples from Wells SW-2, E, F and G were analyzed for manganese. The Well F sample contained 0.068 mg/l. Wells SW-2, E and G contained 6.72 mg/l, 2.42 mg/l and 3.58 mg/l, respectively. Well F contained 0.054 mg/l of zinc and Wells SW-2, E and G contained 1.23 mg/l, 0.367 mg/l and 2.34 mg/l of zinc.

Downgradient chloride concentrations were greater than upgradient concentrations (16.0 mg/l) in Wells SW-2, SW-3, E, F and G. Results of fluoride analysis showed that the samples analyzed contained less than upgradient concentrations, except for the Well F sample which contained 0.8 mg/l of fluoride. The upgradient concentration was 0.07 mg/l.

Results of total phosphorous analysis show that phosphorous was detected only in the groundwater sample collected from Well SW-2 (0.02 mg/l). Results of sulfate analysis showed that the upgradient groundwater contained 480 mg/l. Downgradient wells, except SW-3, contained less than upgradient sulfate concentrations. Well SW-3 contained 2200 mg/l of sulfates.

Pending USEPA and OEPA review of existing groundwater data, it was agreed that limited third quarter groundwater sampling would be performed. A decision was made to sample wells at the outside perimeter of a suspected methylene chloride plume emanating from the tank farm. The sampling results are shown in Table 65.

As shown, low levels of VOCs were detected in Wells A, SW-3 and SW-4. Well G, located at the tributary to Tinker's Creek contains

## HUKILL CHEMICAL CORPORATION BEDFORD, OHIO

TABLE 65

# GROUNDWATER MONITORING RESULTS ORGANIC ANALYSES FEBRUARY 1987 (THIRD QUARTER)

Sample Location Sample Number	Well A W-1	Well A Duplicate W-1A	SW-3 W-2	SW-4 W-3	Well G W-4
Sample Depth (ft)	2/20/87	2/20/87	2/20/87	2/20/87	2/20/87
Parameter (mg/l)					
Methylene Chloride	LD	LD	0.005	0.230	730
Acetone	0.026	0.029	0.004 (J)	0.190	730
Vinyl Chloride	LD	LD	LD	0.012	LD
1,1 Dichloroethane	0.007	0.006	LD	0.013 (J)	LD
Trans, 1-2 Dichloroethylene	LD	LD	LD	0.014 (J)	LD
Ethyl Ether	LD	LD	0.022 (J)	LD	LD
1,4-Dioxane	LD	LD	0.009 (J)	LD	LD
Isopropyl Ether (3)	LD	LD	LD	0.097 (J)	LD

#### NOTES:

- 1. LD indicates less than the detection limit.
- Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample refer to the laboratory reports in Appendix C.
- 3. Isopropyl ether is not regulated as a hazardous substance.
- (J) indicates compound identified and concentration estimated below the detection limit.

elevated levels of acetone (730 mg/l) and methylene chloride (740 mg/l). Methylene chloride increased from 270 mg/l detected in October What is outful us. and discharge 1986. Acetone was not detected in previous samples from Well G.

# 6.12 Surface Water Sampling

Surface water samples of the tributary to Tinkers Creek were collected by EA and sent to the laboratory for organics analysis. An upstream sample was collected to the east of the HCC facility, where the tributary enters the property through a culvert. A downstream sample was collected from the tributary at a location northwest of the HCC facility. The results are shown in Table 66. shere

Acetone was the only VOC detected in the upstream sample (21 ug/1). This concentration was less than detected in the laboratory blanks. Acetone was not detected in the upstream duplicate or field blank samples. The downstream surface water sample contained trace levels of VOCs. Xylene, trans, 1,2-dichloroethane and isopropyl ether were detected in the downstream samples at concentrations of 4 ug/l, 8 ug/1 and 10 ug/1, respectively.

The tributary to Tinkers Creek was also sampled by OEPA in 1985. The results of the OEPA's analyses are presented in Section 6.10, Storm Water Collection System. Surface water sampling by EA was conducted during a dry weather period. At this time, the flow rate of storm water Outfall No. 001 was 30 gal/hr. The flow rate of this outfall when it was sampled by OEPA is not known.

> flow rate 85 Crack? sel for outfall

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TABLE 66

SURFACE WATER SAMPLING RESULTS

ORGANIC ANALYSES

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0.010

0.062

0.055

Sample Location	Upstream	Duplicate Of Blank	Downstream
Sample Number	STR-1	STR-1 of 01 STR-1	STR-2
Sample Depth (ft)	10/2/86	10/2/86 10/2/86	10/2/86
Parameter (ug/1)			
Acetone	21	LD 11,000 LD	LD
Xylene Trans, 1,2 Dichloro-	LD	LD 2,800 LD 560(3)	4 (J)
ethane	LD	LD 2,300 LD	8
Propane, 2-2' Oxybis	LD	LD LD	10 (J)
TOC (mg/1)	18.8	26.2 67.4 1.5	68.1

0.049

# NOTES:

TOX (mg/1)

- LD indicates less than the detection limit. Detection limits are sample specific due to concentration ranges of organics in samples. For the detection limit of a specific sample, refer to the laboratory reports in Appendix C.
- (J) indicates compound identified and concentration estimated below the detection limit.

#### 7.0 DISCUSSION OF RESULTS

#### 7.1 Solvent Tank Farm

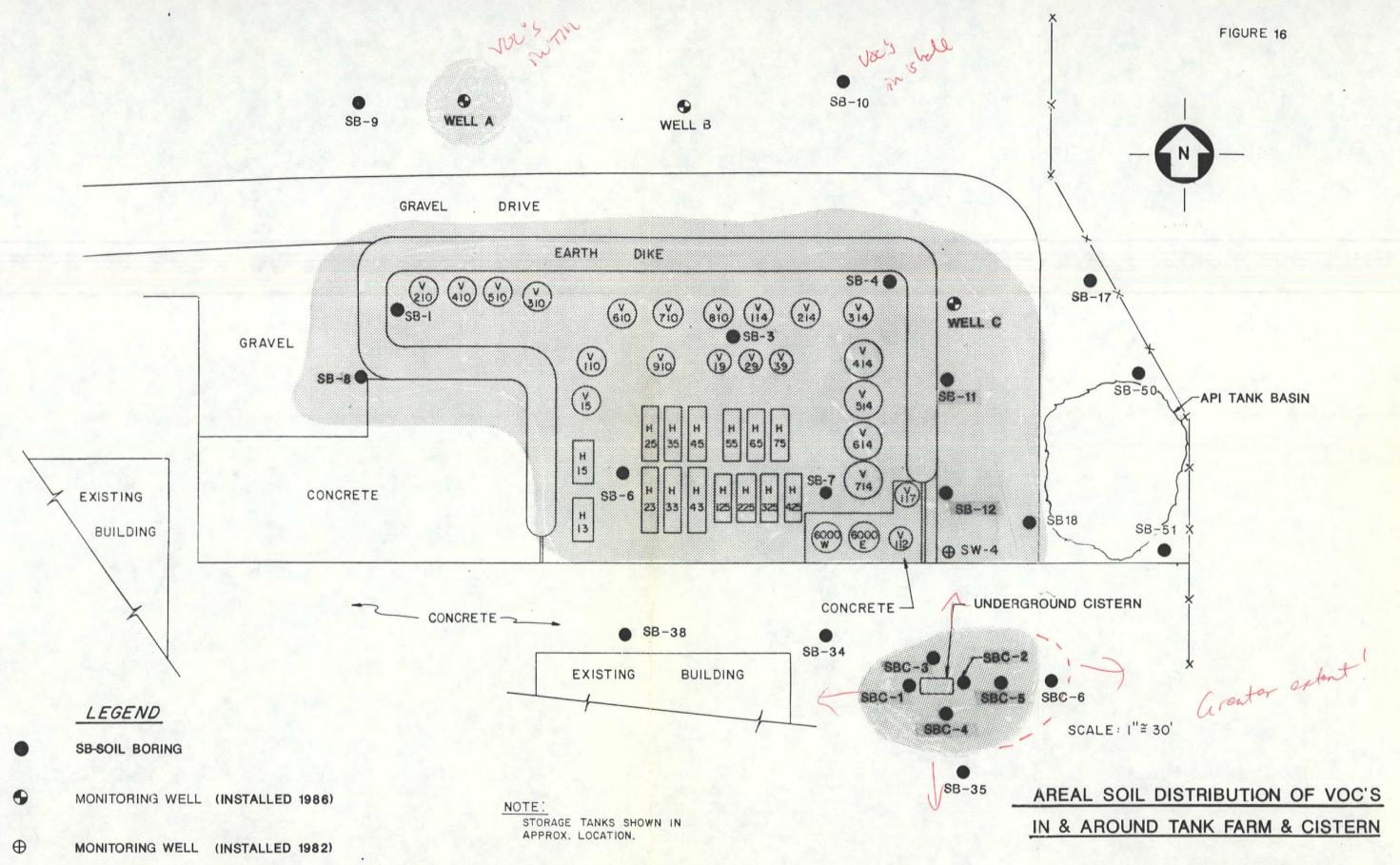
The areal extent of VOCs detected in the soil in and around the tank farm and the cistern is shown in Figure 16. The vertical distribution and extent of VOCs in the soil are shown in cross sections A-A, B-B and C-C shown in Section 6.3. In general, the vertical extent of VOC contamination in the tank farm and to the east of the tank farm is the depth of groundwater (17 ft. to 24 ft.). The variations in concentrations, depth and in the particular compounds detected in the soil samples indicate that their occurrence is the result of surface spills which explains the variability in VOC concentrations by location and depth.

In general, the highest VOC concentrations in the tank farm were detected in and around soil boring SB-7 between grade and 4.5 ft. deep. From 4.5 ft. to the depth of weathered shale (approximately 12.0 to 13.0 ft.) in the tank farm, highest VOC concentrations were detected in the areas of soil borings SB-3 and SB-6.

SBG-TIM: Floaters 563-State: sinkers.

Outside the berm of the tank farm, the highest concentrations of VOCs between grade and 4.5 ft. deep, were detected in the areas of soil borings SB-11 and SB-18. Between 4.5 ft. and the depth of groundwater (20.5 ft. to 24 ft.), highest VOCs were detected in the area of soil boring SB-11 at 12.0 to 13.5 ft.

Samples collected from the boring of Well A contained 49.72 mg/kg of VOCs at a depth of 7.5 to 9 ft. and it cannot be determined whether contamination in this area is due to tank farm operations or to a local spill. However, soil samples from Well A between 16.5 to 17 ft. and 20.0 to 20.5 ft. contained only 0.132 mg/kg and 0.171 mg/kg of VOCs. Samples collected between grade and 7.5 ft. were screened using



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the OVA, but were not submitted for laboratory analysis. OVA readings of samples collected at 0 to 1.5 ft. and 1.5 to 3.0 ft. were 3.4 ppm and 38.0 ppm, respectively. Groundwater samples collected at Well A contained only trace levels of VOCs.

Soil samples collected from soil boring SB-10 at or near the depth of groundwater (approximately 20 ft.) contained VOCs (43.1 mg/kg).

These VOCs may be attributed to VOCs in groundwater, since low VOC levels were detected in the boring at 4.5 to 6.0 ft.

Metals analyses of three soil samples collected in the tank farm area characterized by the highest levels of VOCs show metals concentrations similar to background.

The extent and concentrations of contaminants in the groundwater around the tank farm are shown in Figures 17 and 18. These figures show methylene chloride isoconcentration contours based on first and second quarter groundwater sampling at the HCC site.

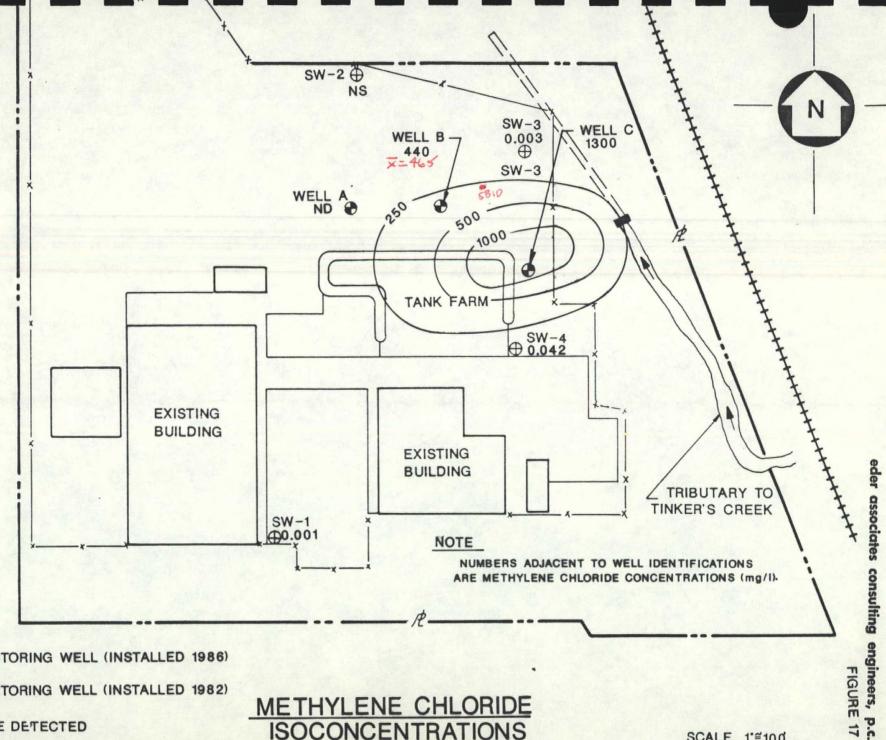
The highest concentration of methylene chloride was detected at Well C, located near the northeast corner of the tank farm. Based on the data collected to date and the site hydrogeology, the areal extent of methylene chloride in the groundwater is limited to the tributary to Tinkers Creek which is the point of groundwater discharge.

about culient and deeper flow

Surface water sampling and analysis in October 1986 did not reveal the presence of methylene chloride in upstream or downstream samples. Surface water sampling by the OEPA in 1985 showed an increase in downstream methylene chloride concentration, however, this was apparently the result of elevated levels of methylene chloride in the outfall. Is it not going in week or aerabal

The vertical extent of VOCs in the groundwater is limited to the weathered shale. The weathered shale is underlain by highly consolidated gray shale which forms a confining layer.





- MONITORING WELL (INSTALLED 1986)
- MONITORING WELL (INSTALLED 1982)

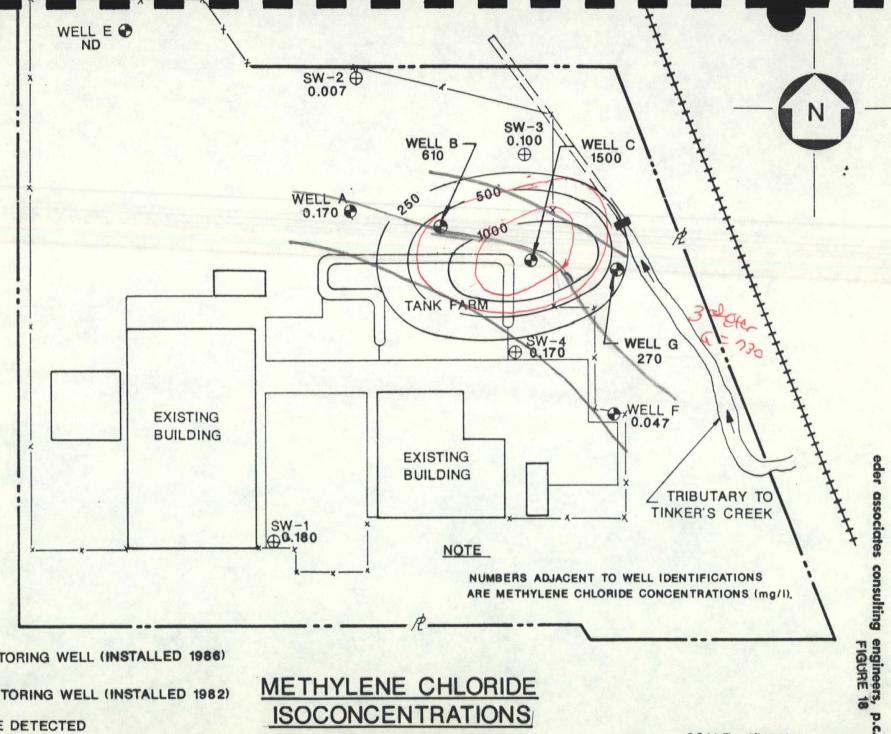
NO NONE DETECTED

NS NOT SAMPLED

METHYLENE CHLORIDE ISOCONCENTRATIONS **MAY 1986** 

SCALE 1"≅100





- MONITORING WELL (INSTALLED 1986)
- MONITORING WELL (INSTALLED 1982)

ND NONE DETECTED

METHYLENE CHLORIDE ISOCONCENTRATIONS SEPTEMBER/OCTOBER 1986

SCALE 1'=100'

Methylene chloride was not the primary constituent detected in soil samples from the tank farm, however, the data indicates that the release of methylene occurred in the past and that there is probably no continuing source or release. How is this concluded?

MC, levels increasing.

February 1987 analysis of Well G samples found acetone although none was detected in previous sampling. Acetone was detected in Well B at 92 mg/l in May 1986, but was not in the Well B duplicate. The anomalous occurrence of acetone in Wells B & G will be confirmed by additional sampling.

Physical conditions in the tank farm could increase the rate of migration of contaminants from the tank farm to groundwater. The two sumps in the tank farm are used to collect precipitation (perched water), which accumulates in the tank farm. These sumps are open at the bottom and top and the annular space between the outside of the sump pipe and the earth is not sealed. Precipitation accumulates in the northeast and southwest corners of the tank farm in the general area where the sumps are located. Moreover, grade is slightly lower in these corners of the tank farm, and these areas are natural collection points for any spills in the tank farm area.

Perched water was encountered in the tank farm, around the cistern and beneath the process building. The tank farm is the apparent source of the perched water around the cistern and beneath the process building and perched water migrates through the fill around underground piping and beneath structures. Static levels of perched water in the tank farm are approximately 1.0 to 2.5 ft. above perched water levels in the cistern and beneath the building indicating the existence of a hydraulic gradient which causes perched water flow from the tank farm to the other areas.

#### 7.2 Underground Cistern

The areal extent of VOC contamination in the soil around the cistern is shown in Figure 16 in Section 7.1. The vertical extent of

VOCs is shown in the cross section, Figure 15 in Section 6.6. In general VOCs were detected to the depth at which groundwater was encountered. Background VOC levels were approached in soil samples collected from boring SBC-6, SB-34 and SB-35 which generally bound the soil contamination in the area of the cistern.

Perched water with a floating a layer of mineral spirits was observed entering the cistern through and around the inlet pipe. Borings drilled through the floor of the process building identified the presence and general extent of the mineral spirits and perched water that migrates to the cistern along and in the interconnecting piping. The occurrence of perched water under the plant is apparently limited to subsurface areas that are backfilled with permeable material (i.e., sand) particularly around underground piping. Perched water was not encountered in soil borings SB-34 and to the east of the process building.

Analysis of water in the cistern and perched water beneath the plant shows the presence of methylene chloride and various ketones in concentrations which suggest a common origin. Contaminants in perched water under the building and in and around the cistern are reasonably linked to the past operation of the cistern and to the interconnected floor drain system in the plant. These drains are now sealed. Possible additional sources of contamination in the perched water are from standing liquid in the pump room and distillation area where liquid could seep through the concrete floor.

VOC contaminants were detected in the groundwater sample collected at Well F. The VOCs included methylene chloride (0.47 mg/l), xylene (0.012 mg/l), vinyl chloride (0.024 mg/l) and trans, 1,2-dichloroethylene (0.240 mg/l). The concentration of methylene chloride detected in Well F was less than the background upgradient well. It is reasonable to expect that contamination in the soil and in perched water in and around the cistern would be reflected in the groundwater at Well F by the presence of ketones and methylene chloride. However, these contaminants were not detected in groundwater at Well F.

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#### 7.3 "Chem-Pack" Fill

The "Chem-Pack" material used to grade the site varies in depth from 1.0 ft. to 9.0 ft. with a maximum depth of 15 ft. in the area of soil boring SB-21.

The primary constituents in the "Chem-Pack" are iron, manganese, chromium, zinc and copper. EP toxicity tests showed low leachability of the metals from the "Chem-Pack" material and barium, which was detected at a low level (0.27 mg/l), was the only EP toxic metal detected in the leachate. Based on the EP toxicity results, the "Chem-Pack" does not exhibit EP toxic characteristics.

Leachate from the "Chem-Pack" material contained high levels of sulfate. However, the "Chem-Pack" is neutralized pickle liquor which would be expected to contain calcium sulfate, a product of lime neutralized pickle liquor.

Metals at concentrations similar to those detected in the "Chem-Pack" were also found in soil approximately three ft. below the "Chem-Pack". However, EP toxicity tests show that these metals are not readily leachable. The occurrence of metals found in the soil at this depth is likely the result of mixing "Chem-Pack" and soil during surface grading operations.

Two anomalous samples were encountered while drilling in the "Chem-Pack" area. The samples appeared to be foundry sand, which may be an artifact from filling and grading and a variant of the "Chem-Pack" material with a higher concentration of chromium and lime. Neither of the anomalous samples were EP toxic.

Samples from Well SW-3, located downgradient of the "Chem-Pack" fill area showed elevated levels of sulfates and chlorides and these parameters were also detected in "Chem-Pack" leachate.

Well SW-3 contained similar EP toxic metals concentrations to background, which shows that EP toxic metals are not leached from the "Chem-Pack" to the soil and groundwater. "Chem-Pack" is apparently a source of copper and iron detected in downgradient groundwater.

The occurrence of elevated levels of sulfates and chlorides in groundwater is limited to the area downgradient of the "Chem-Pack". Iron found in groundwater at Well SW-2 originates in the "Chem-Pack" area and/or at the northwest fill.

# 7.4 Northwest Fill

The northwest fill is made up of construction debris, foundry sand and slag containing iron, zinc, lead, manganese, copper and nickel. EP toxicity tests on fill samples showed levels of metals at concentrations up to one hundred times less than EP toxic concentrations. No VOC or PAH compounds were detected in the fill at levels above background.

Monitor Well E located downgradient of the northwest fill contained an elevated level of iron probably originating from foundry sand and/or slag.

#### 7.5 Neutralization Pits

The major constituent in samples from both pits was iron. Copper was detected at 657 mg/kg in the west pit and at 203 mg/kg in the east pit. Nickel was detected in both pits at 54 mg/kg and 35 mg/kg. Other metals were detected at concentrations similar to background. EP toxicity tests were not performed on neutralization pit samples.

Monitor well SW-2 is located downgradient of the neutralization pits and "Chem-Pack" and shows elevated levels of iron and copper. The neutralization pits may have in the past or may presently be contributing to the iron and copper detected in downgradient Well SW-2.

The USEPA expressed concern that organic solvents may have been disposed of in the neutralization pits. The plant operating records indicated that isopropyl ether was the only organic product treated in the neutralization pits and it is not a hazardous regulated substance. Isopropyl ether was detected in soil samples out to soil boring SB-43. However, organic analyses of samples collected from the neutralization pits do not show the presence of VOCs other than isopropyl ether at concentrations greater than background and Well SW-2, located downgradient of the neutralization pits, did not show detectable levels of VOCs.

#### 7.6 Container Storage Area

VOCs and metals were detected in the soil around the perimeter of the container storage area in concentrations and at depths which varied from one boring to another indicating that their occurrence is related to surface spills. Moreover, the VOCs are generally limited in vertical extent to the uppermost 10 ft. of soil.

Low levels of VOCs including methylene chloride, xylene, vinyl chloride and trans, 1,2-dichloroethylene were detected in groundwater at Well F. These VOCs characterize the container storage area and not the contaminants found in and around the cistern. In general, concentrations of metals (lead, chromium, barium and mercury) were found to vary in similar fashion to the VOCs and, even where the VOCs were highest, metals concentrations (except mercury) did not exceed twice background. Mercury was found at 1.5 mg/kg. Groundwater at Well F showed low levels of barium and chromium.

# 7.7 API Tank Basin Area

SB51:89.5' Till surface below fill.

VOC concentrations in soil boring SB-50 were similar to background levels, and VOCs in SB-51 approached background at a depth of 16.5 ft. Metals in the soil sample from soil boring SB-51 which contained VOCs, showed concentrations less than metals background. Soil contamination with VOCs in the area of the API tank appears limited to the area around soil boring SB-51.

# 7.8 Storm Water Collection System

Effluent limitations for COD, TOC and BOD have been exceeded at Outfall No. 001. During dry weather there is a low flow discharge from Outfall No. 001 which contains VOCs. These VOCs could cause elevated levels of COD, TOC and BOD. There are no known process piping connections to the storm water collection system.

Effluent limitation exceedances are apparently caused as subsurface perched water containing VOCs migrates to and infiltrates the storm water piping system. This infiltration also explains the low flow discharge which occurs during dry weather. During periods of wet weather, runoff flowing through the piping system decreases VOC concentrations as shown by the inverse proportional relationship of COD and flow rate.

The backfill around piping in areas around the cistern and solvent tank farm provides a conduit for migration of contaminants in perched water. Based on the COD data, there does not appear to be a VOC source to the storm water collection system in the plant areas west of the shipping dock.

EA found no significant increase in the concentration of VOCs in downstream surface water, and any VOCs detected were close to the method detection limits.

Sampling conducted by OEPA also found VOCs in the outfall. Based on the OEPA's results, the discharge from the outfall can be assumed to cause the increase in downstream concentrations of VOCs. As EA's sampling supports no such conclusion, it is impossible to say with confidence that any downstream impacts are related to the HCC discharge, although the outfall is the probable source of elevated methylene chloride in downstream surface water as reported by the state.

At present, HCC collects the water infiltrating the storm water piping during dry weather periods. The water is collected in the 1500 gal. outfall tank and is transferred to the API tank, where it is stored for subsequent off-site disposal at a permitted facility. This operating practice minimizes the volume of perched water entering the creek through the outfall during dry weather periods.

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#### 8.0 ENVIRONMENTAL ASSESSMENT

Chemical residues attributable to past facility operations are found in soils, subsurface water and at an outfall to surface waters, however, there is no significant threat to the environment and any health related risks are limited to certain on-site locations and activites.

#### 8.1 Contaminant Identification

Laboratory analysis has established the concentration of chemical residues in each media at the HCC site (Section 6.0).

Residues found in soils differed from location to location at the site. Soils in and around the cistern, tank farm and container storage area contain elevated levels of the organic constituents, methylene chloride, acetone, 2-butanone, tetrachloroethylene, toluene, ethyl benzene and total xylenes. Soils in the "Chem-Pack" fill area contain high levels of iron, manganese, copper, chromium and zinc. The northwest fill area also contains elevated levels of iron, manganese, copper, nickel and lead. Areas in and around the

neutralization pits show elevated levels of iron and isopropyl ether.

Groundwater containing elevated levels of methylene chloride was found downgradient of the tank farm, however, the vertical distribution of this and other organic chemicals in the groundwater is limited to the weathered shale. The areal extent of contaminated groundwater is limited and groundwater discharges to surface water which is of notably poor quality both upstream and downstream of the HCC site.

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# 8.2 Exposure Evaluation

# Environmental Fate & Transport

A number of organic chemicals were found in the soil and groundwater at the HCC facility, however, for the purposes of this study it is not necessary to assess the migration and fate of each chemical. Methylene chloride is a useful, probable worst case indicator because it is the most common and mobile contaminant found at the site.

Concentrations of methylene chloride were greater than the other organics found in the groundwater, yet it was found to be generally equivalent to concentrations of organic contaminants found in the vadose soil environment. Organic compounds have a wide affinity for organic and inorganic solids in the soil, and the greater this affinity is for solids, the lower it is for water. Organic compounds with higher solubility in water migrate more readily than compounds which are less water soluble and the octanol/water partition coefficient roughly mimics the adsorptive properties it would have in soil. This is a ratio of the amount that a compound dissolves in octanol divided by the amount that dissolves in water. A high partition coefficient indicates that where a substance dissolves preferentially in octanol, it would be strongly adsorbed onto soil particles and would not be very mobile in the environment.

The octanol/water partition coefficients and water solubilities of some common organics found in the soil at HCC are as follows:

Compound	Water Solubility (mg/l)	Octanol/Water Partition Coefficient (dimensionless)
Methylene Chloride	17,000	18
Trichloroethylene	1,100	190
1,1,1-trichloroethane	950	150

The octanol/water partition coefficient for methylene chloride is low and it has a very high solubility in water and a very low affinity for soil. Methylene chloride is very mobile in the subsurface environment, and the fact that higher amounts of methylene chloride are present in the HCC groundwater than in the overlying soils indicates that the majority of it has migrated into the groundwater system.

Methylene chloride was found to exist in higher concentrations in downstream surface water samples than upstream samples. It is reasonable to assume that contaminants in the groundwater (mainly methylene chloride) would migrate to and discharge into the surface water tributary system yet the upstream — downstream difference in methylene chloride is inconclusive.

## Exposure Routes

Relevant exposure routes at the HCC site are limited to the consumption of contaminated groundwater or surface water, contact with contaminated soils and groundwater and contact with contaminated surface waters.

There are no known domestic, industrial or municipal wells downgradient to the groundwater discharge point and the entire site, including the groundwater discharge which is owned and controlled by HCC. Potable groundwater in the area is obtained from underlying sandstone formations which are separated from the upper groundwater and surface water systems by a thick shale siltstone sequence.

In accord with USEPA's "Guidelines for Groundwater Classification under the EPA Groundwater Protection Strategy", the limited upper groundwater at the site would be classified as a Class III System, which applies to groundwaters that are not potential sources of drinking water.

The possibility of exposure through groundwater ingestion or dermal absorption is limited to on-site personnel that would have prior knowledge and would wear appropriate protective clothing. Personnel exposure to contaminated soil is limited to the "Chem-Pack" fill area, the neutralization pit area and inside the tank farm. Personnel working in these areas would have prior knowledge and would wear appropriate protective clothing. If excavation work is conducted in soils around the tank farm, "Chem-Pack" fill area, neutralization pits, northwest fill area, container storage area, cistern and API tank areas, contractor's personnel would have prior knowledge and would wear appropriate protective clothing.

Peoples exposure to contaminated soils, groundwater or surface waters is remote. The general public is not allowed on site without reason and supervision. All wells are capped and locked, the facility is surrounded by a fence which is also locked each night. The facility complies with Federal and state regulations governing security at treatment, storage and disposal sites.

# 8.3 Risk and Environmental Toxicity Evaluation

The consumption of groundwater migrating from the HCC vicinity is remote. There are no potable wells downgradient of the plume and all local potable water is supplied by municipal, industrial or private wells which obtain water from aquifers far below and separated from the limited groundwater available at HCC. All monitoring wells at the site are capped and locked. Contact with groundwater is not possible at the site unless permitted by HCC. Personnel engaged in sampling activities have prior knowledge and use of protective clothing. The possibility of future risk is reasonably avoided by placing a notice and restriction on groundwater use and contact in the property deed.

The risk to on-site personnel posed by contaminated soils found on-site is insignificant. HCC personnel regularly work with hazardous substances as part of their daily routine. HCC management requires

that all personnel wear protective clothing (i.e., boots, gloves, etc.) at all times while working on the site. The facility complies with Federal and state regulations governing personnel training for workers at treatment, storage and disposal sites.

Exposure to contaminated surface water is limited to casual contact by an unknowing population and is not likely because there are no nearby residential areas and the stream has no recreational value.

Ecological studies conducted by the OEPA have shown that there are no viable fish communities in the Deerlick Run drainage system which is classified as a "Nuisance Prevention Stream". A September 1986 report submitted by the OEPA, "Toxicity Evaluation Report on Surface Water Discharges, Hukill Chemical Corporation", recommends that this designation continue.

Downstream environmental and public health impacts caused by discharges from the HCC site are insignificant and cannot be measured with confidence. The entire Deerlick Run stream network downgradient of HCC is degraded by chemical discharges which cannot be attributed to HCC activities.

# 8.4 Contaminants and Applicable Guidelines

The Deerlick Run drainage system is classified as a "Nuisance Prevention Stream" and neither the creek nor the groundwater is a potential drinking water source. Drinking water standards, Maximum Contaminant Levels (MCLs) and Recommended Maximum Contaminant Levels (RMCLs) are not relevant.

Table 67 shows the Water Quality Criteria for organic and inorganic contaminants identified in the creek, groundwater, soil and outfall at HCC. Of the organics detected in the creek by the OEPA and EA, all were detected at levels less than the acute aquatic toxicity criteria. With the exception of 1,1,1-trichlorethane and methylene

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TABLE 67

# WATER QUALITY CRITERIA(1)

Organics	Acute Freshwater Aquatic Toxicity ug/1	Chronic Freshwater Aquatic Toxicity (ug/1)	Human Health(2)	3745-1-07
Methylene Chloride	11,000 (3)	(5)	0.19	9,700
Vinyl Chloride	(4)	(5)	5.25	
Acetone	(4)	(5)	(6)	550,000
1,1 Dichloroethane	(4)	(5)	(6)	
Trans-1,2 Dichloroethylene	11,600	(5)	(6)	7,000
2-Butanone	(4)	(5)	(6)	168 800
√ 1,1,1-Trichloroe thane	(4)	(5)	1.03	2,000
Trichloroethylene	45,000	(5)	80.7	1,700
Benzene	5,300	(5)	40.0	1,000
4-Methyl-2 Pentanone	(4)	(5)	(6)	-
2-Hexanone	(4)	(5)	(6)	-
Tetrachloroethylene	5,280	840	8.85	540
Toluene	17,500	(5)	424 mg/1	2,400
Ethyl Benzene	32,000	(5)	3.28 mg/1	1,400
Xylene	(4)	(5)	(6)	-
Isopropyl Ether	(4)	(5)	(6)	_
Inorganics				
Arsenic	440	(5)	17.5 ng/1	360
Barium	(4)	(5)	(6)	_
Cadmium	0.012-0.051, 1.5-	6.3(7)	(14	10)00046-186

<u>Organics</u>	Acute Freshwater Aquatic Toxicity ug/l	Chronic Freshwater Aquatic Toxicity (ug/1)	Human Health(2) 3745-1-07 (ug/1) (vg/1)
Chromium	2200-9900 (8)	44	(6) (HD)2120-5800
Lead 74-400 (8)	74-400 (8)	(5)	(6) Horshars Agant
Mercury	0.2, 4.1 (9)	(5)	146 ng/1 2.2
Copper	5.6, 12-43 (7)	(5)	(6) (H.D) 23-67
Iron	(4)	(5)	(6)
Nickel	56-16, 1100-3100 (7)	(5)	100 (4.0,)1580-4790
Manganese	(4)	(5)	(6)
Zinc	47, 180-570	(5)	(6) (H.D) 390-1060
Chloride	(4)	(5)	(6)
Fluoride	(4)	(5)	(6)
Phosphorus	(4)	(5)	(6)
Sulfate	(4)	(5)	(6) =

#### NOTES:

- The values in this table are the Water Quality Criteria Guidelines based on acute and chronic toxicity
  to freshwater aquatic and established water, the USEPA's "Clean Water Act".
- This value is based on ingestion of aquatic organisms and excludes the consumption of a compound in drinking water. This value is based on a lifetime cancer risk of 10 EE-6.
- 3. This concentration applies to total halomethanes.
- 4. No acute toxicity level for freshwater aquatic life has been established.
- 5. No chronic toxicity level for freshwater aquatic life has been established.
- 6. No human health level for consumption of aquatic organisms has been established.
- 7. First values reported are the 24-hour average. Second range of values are the maximum values at any time and values are dependent on calcium carbonate hardness. The range corresponds to hardness ranging from 50 mg/l to 200 mg/l.
- Acute toxicity level is dependent on calcium carbonate hardness. Values given correspond to hardness ranging from 50 mg/l to 200 mg/l.
- 9. The first value is the 24-hour average. The second is the maximum limit at any time.

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chloride detected at 20.5 ug/l and 349 ug/l by the OEPA, all organic concentrations were less than the Water Quality Criteria for human health, based on injestion of contaminated aquatic organisms. Sampling and analysis by EA in October 1986 did not reveal the presence of either of these organics in the creek at HCC.

# 8.5 Conclusions

Although facility operations at the HCC site have resulted in the release of contaminants, the potential for direct contact with or consumption of contaminated media is remote and there is no increased risk to an unknowing population or to the environment.

#### 9.0 PROJECT OBJECTIVES AND ALTERNATIVE CORRECTIVE ACTIONS

The need for remedial action at the HCC facility is limited to those measures which would minimize the existing low order threat to on-site personnel and to an unknowing population which may contact downstream surface water. Specific project objectives are established in this section based on the results of the site work and the Environmental Assessment. Alternative corrective actions will be presented and discussed in Task 4, "Review of Alternative Corrective Actions" as described in EA's November 1985 engineering report, "Plan for Determining the Extent of Potential Contamination".

## 9.1 Project Objectives

The specific objectives to be achieved at the HCC site are as follows:

- Minimize the possibility that personnel could be exposed to soils in the areas of the solvent tank farm, underground cistern, Chem-Pack fill, northwest fill, neutralization pits, no free liquid storage area and API tank basin.
- Prevent consumption and minimize physical exposure to groundwater and perched water at the site.
- Prevent consumption of surface waters transiting the site.
- 4. Minimize the generation of perched water in the tank farm.
- Minimize the migration of contamination from the surface to the perched water and groundwater.
- Minimize the potential for further releases of waste constituents.

Physical exposures to contaminated soils, perched water and groundwater and the consumption of groundwater are effectively controlled at HCC. The project objective of preventing on-site contact with or consumption of affected media is achieved by current operating practices.

Although HCC cannot control public access at off-site locations, the surface waters are classified by OEPA as "Nuisance Prevention Stream", which has no recreational value and is not a drinking water source.

# 9.2 Alternative Corrective Actions

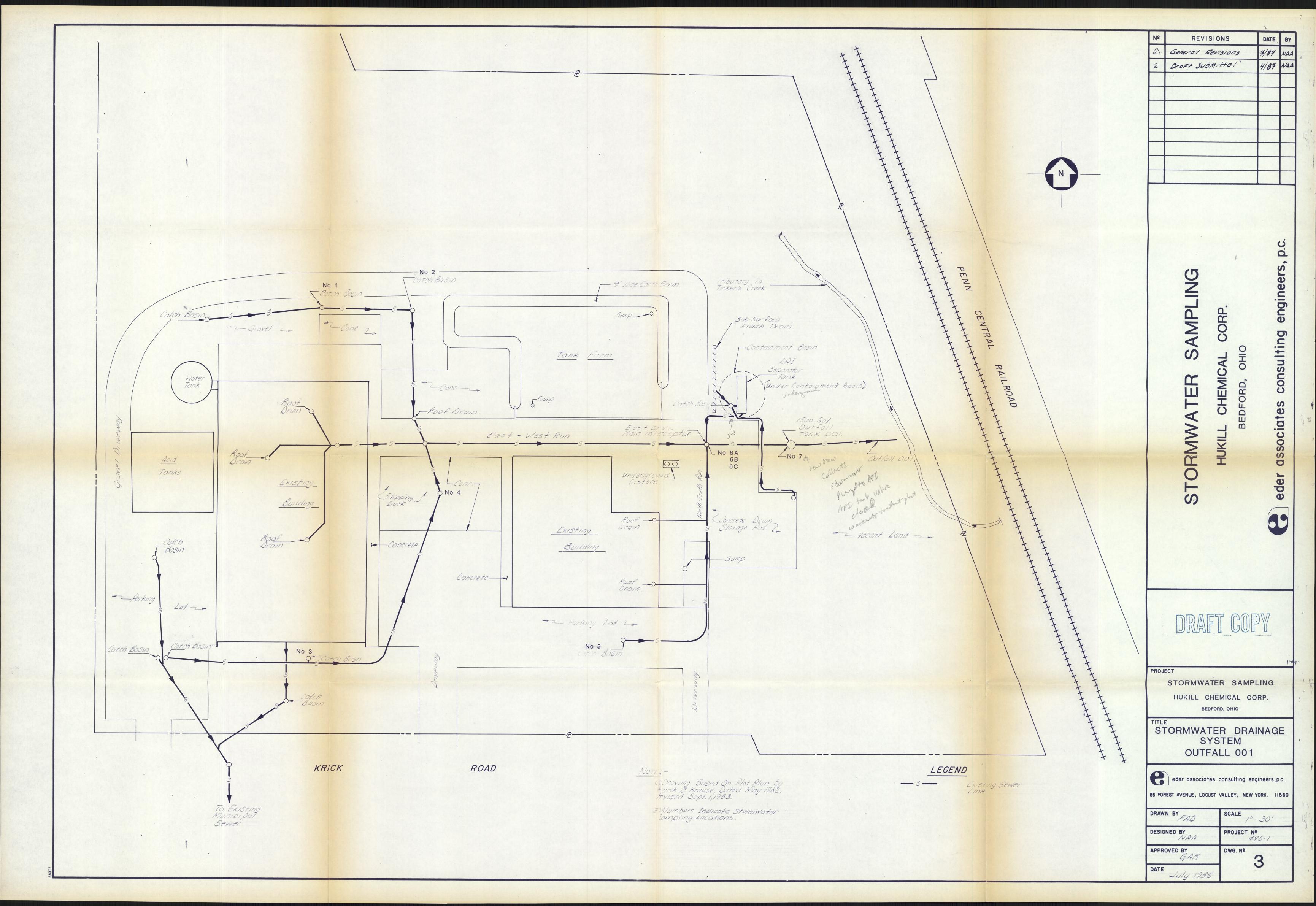
The project objectives can be achieved through a limited remedial action program with the following outputs:

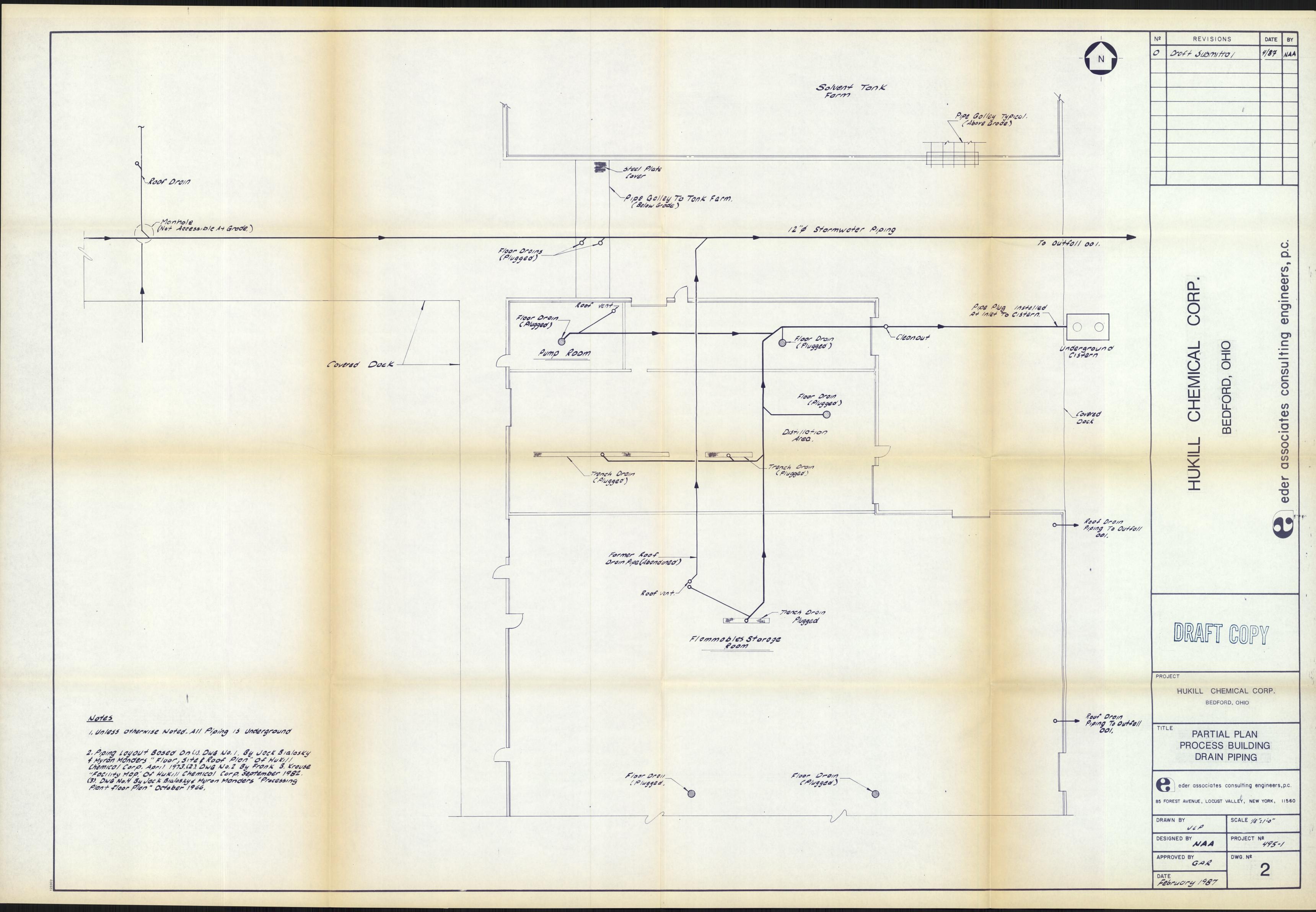
- 1. Manage groundwater at the site in accord with RCRA alternate concentration limits through groundwater monitoring and institutional control.
- 2. Minimize the migration of residuals from the surface to perched water and from perched water to groundwater. Objective 5
- 3. Minimize the discharge of residuals to surface water at Outfall 001. (Objective b)
- 4. Ensure that adequate notice survives the use of the site by HCC. (Objectives 142)

  What about Surface Water and affects,

  Cid disctarge

APPENDIX A





APPENDIX B

DATE STANTED 5-12-86  BORNING REPORT  BORNING FOREMAN: JOHN DIDECLE DILY  BEST TOOL 1311 - 495 01  BORNING REPORT - JOHN DIDECLE DILY  BORNING TORMAN - JOHN DIDECLE DILY  BEST TOOL 1311 - 495 01  BORNING TORMAN - JOHN DIDECLE DILY  BEST TOOL 1311 - 495 01  BORNING TORMAN - JOHN DIDECLE DILY  BORNING TORMAN - JOHN DILY  BORNI	TYPE	ES:	BORING 13	-	CASING -	ROCK TO	-	FT THEN	_	CASING	Maria Tara	TO			
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DATE STA	ARTED : E	5.14.	86		eder	assoc	SHEET					
AND DESCRIPTION OF THE PERSON NAMED IN	ISHED: 5	THE RESERVE TO THE PERSON NAMED IN	THE RESERVE THE PERSON NAMED IN COLUMN 2 IS NOT THE OWNER.		BORI	NG REP	ORT		BORIN	NG NO. 88 6		
CLIENT				AL CORPOSA	-							
				E INVESTIGA		2 POT	IRITHE	(ONTAM	MOTION			
	NO. (S):		01	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,							AND SHOP	
-	ONTRACTO			GEOTECHNICAL			BORING	FOREMAN	JOHN	DINGL	OWE	
STES EN	GINEER:			PIANAS			INSPEC		IKK RE			
501110115		The state of		SOIL SA	MPLER		CORE		085. WEL		DRILLIN	G RI
EQUIPMEN		CAS	ING	SPLIT SPOON (SS)	UNDISTURBE	(US) E	BARREL	AUGER	PIPE	CAP	AND MET	тно
TYPE:		HU		CARBON STEEL	1 STEEL HSA -						POWER H	IAN
SIZE:		6"		2" 00	23/4 -						GROUND	Ho
HAMMER W	T/ FALL	1401		140/30	_		DRILL					
SURFACE	ELEVATION	11		NORTH COORDI	NATE:			EAS	T COORDINAT	TE:		
SURFACE	CONDITION	13: 50	w end	OF TANK FA			LEV	EL . L	ST SU	2FACE	PONDING	
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BELOW	BLOWS	TYPE	DEPTH	BLOWS /6" OR	DEPTH/			% Little =			nstruction	
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	NAME AND			E INVESTIGE		02 PU	TENTI	94 CON	TAMINIA	MONT	
PROJECT	NO. (S):	49	501								
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COILS EN	GINEER:	NICK	AND	PIANAS			INSPEC	TOR: K	ICK R		
EQUIPMEN	IT:		ING	SOIL S	AMPLER		CORE	AUGER	085. WE	LL (OW)	ORILLING I
				SPLIT SPOON (SS)	UNDISTURBE	ED (US)	BARREL		PIPE	CAP	AND METHO
TYPE :		Hu	)	CARBON STEEL	-		_	H5A	-	-	POWER HA
SIZE		6"		2" 00				23/4	_	-	AUGER GRO
HAMMER W	T/ FALL	PUSHE	D	140/30	-			BIT.			406 051K
SURFACE	ELEVATION	V :		NORTH COORD	INATE:			EAS	T COORDINA	TE	
SURFACE	CONDITION	151									
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DATE ST	ARTED !							ciates		/ SHEE		1		
Children or other statements		5 - 7 -						PORT		BORI	NG NO.	SB 8		
CLIENT :	HUKI	LL C	HEMICA	L coi	2 POR ATI	ION								
PROJECT						TION FO	R Po	JAITHET	CONTAM	MOITANI				
	NO. (5):		15 01											
RING C	CONTRACTO			680 TE	CHPICA	L		BORING	FOREMAN	UHOL. 1	DINGLE	3410		
HLS EN	GINEER		APP					INSPEC	TOR : N	ICK REC				
					SOIL SA	MPLER		CORE			LL (OW)	DRILLING RI		
EQUIPME	NII	CAS	ING	SPLIT S	POON (SS)	UNDISTURBE	D (US)	BARREL	AUGER	PIPE	CAP	AND METHOD		
TYPE	HW	HL	w)	CALRE	V STEEL				HSA	-	-	CME 55		
SIZE:	1,0	6'	1	2"		-		-	6*	-	-	MOBILE DRIE		
HAMMER V	VT/ FALL	1401		140/		7.2	E HIS ISS		BIT.	55 BL 5 S S		THOOPEC PRIC		
SURFACE	ELEVATIO	The second desired laws		-	RTH COORDI	NATE:			EAS	T COORDINA	TEI			
	CONDITIO			1			100							
GROUNDW			T. AFTER		HRS.	FT. AFTE	R	HRS.				The same		
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ATE FIN	ATED : 5	1.2.	86			$\exists$	BORIN		ciales		( SHE		1 5B 9	
LIENT :	HUKIL	L CH	EMICAL	_ (	ORPORATION									
ROJECT	NAME AND	LOCATI	ON E	SITE	INVE	STIG	ATION	FOR	POTE	NTIAL	CONTA	MINATIO	W	
OJECT.	NO. (8):	4	950	1				1551						
TING C	ONTRACTO	R: T	21665	S	GEOTEC	HN	ICAL		BORING	FOREMAN	V DINGL	EDINE		
TES EN	GINEER:	PIC	KAL	205	IAPAS				INSPEC	TOR : L	JICK R	RECCHIF	7	
OUIPMEN	T.	CAS	ING		THE RESERVE OF THE PARTY OF THE	-	APLER		CORE	AUGER	OBS. W	ELL (OW)	DRILL	ING RI
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ZEI	2000			á	00 "		-			6"	-	-	Mobile	00
AMMER W	T/ FALL			1	10/30					BIT.			THOUSE	DEI
	ELEVATION				NORTH CO		ATE:			EA	ST COORDIN	ATE		
	CONDITION				( 62AS	2								
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ELOW	BLOWS	TYPE	DEPTH	200	BLOWS /6"		DEPTH/		race = 0-10			Co	nstructi	on
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- 1		-	2 1		6 7		1	48	sand 4	genrel		A CONTRACTOR OF THE PARTY OF TH		
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		70	~				8.5							
	55	18	7.5-9		1 2	2	The Total	00	10:	0 / 1111				
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		270	12 12	7	37 6	5	14. 14.8		te. SAN	d + gear	rel	TILL	-	
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DATE ST	ARTED		0.86			eder	asso	ciales		/ SHEE		1	
DATE FIN			- 86			AND DESCRIPTION OF THE PERSON NAMED IN	NG RE	PORT		BORI	NG NO.	SB 10	
CLIENT :			HEMIC						0 11-12				
				E INV	t5116 A	MON F	OR	POTENT	IAL CO	NYAMIN	MOITA		
	NO. (3):		501					1		1.1.1			
	ONTRACTO		21665			ICAL			S FOREMAN	201114	DING		
BOILS EN	GINEER :	DI	CKA	NDSIB	SOIL SA	W21.50		INSPEC	TOR		RECCHI	DRILLIA	10 810
EQUIPME	NT	CAS	ING	****		UNDISTURBE	o fue i	BARREL	AUGER	PIPE	CAP	AND ME	
TYPE				CARBON		-	0 (03)	- WARREL	HSA	-	-	CME 5	
SIZE				311 0					6"	_	-	THE RESERVE	
HAMMER V	VT/ FALL			40/3					BIT.			Mobile .	DRILL
	ELEVATIO	N:		the Real Property lies, the Person lies,	H COORDI	NATE:			EAS	T COORDINA	TEI		
	CONDITIO		RY L	EVEL	ARTER OF			Mark Control		Part II.	The Till		8.28
GROUNDW	ATER AT				RS.	FT. AFTE	R	HRS.	I HAVE		Par Thomas		
DEPTH	CASING	100				STRATA		ESCRIPTION	N AND REMA	RKS	Mo	nitor Wel	1
BELOW	BLOWS	TYPE	DEPTH	BLOWS	5/6" OR	DEPTH/	1	race = 0-10	% Little .	10-20%	Total Control	nstructio	
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QUANTIT		16	L.F. 501	8.	5 L.F.	ROCK	11 5	S SAMPLE	5 -	US TUBE	15 -	L.F. OW PIPE	
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DATE FIN		5.5	Control of the local division in which the local division is not to the local division in the local division i			BORIN	IG REF	ORT		BORII	IG NO.	SBI	
CLIENT :				MICAL COE				THE BY					
_	NAME AN	LOCATI	10 NO	TE INVESTI	GAT	TION F	or po	TENTIA	L CONT	MINATIO	W		
PROJECT	NO. (S):	494	501							ALL BAS			
_	ONTRACTO			GEOTECHE		L			FOREMAN		0110		36
AGB EN	GINEER :	N	CK A	NORIANA!				The second second	TOR : N	ICK R			
EQUIPMEN	NT:	CAS	ING	SOIL				CORE	AUGER	083. WE	LL (OW)	DR	ILLING RIG
	19/19/19	A A		SPLIT SPOON (S	_		0 (US)	BARREL		PIPE	CAP	_	D METHOD
TYPE				CARBON STEEL	-	_		-	MSA	-	-	CM	E 55
SIZE .				2"00		-		-	6"	-	-	Mohi	le Deill
IAMMER W				140/30		_			BIT.			1.00	
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		10.5	T. AFTER	EDB HRS. /	3	FT. AFTER		HRS.	AND DO				
DEPTH	CASING	-	-			STRATA			AND REMA		Mo	nitor	Well
BELOW	BLOWS	TYPE	DEPTH	BLOWS /6" 0		DEPTH/			% Little =		Co	nstruc	tion
GND.	PER FT.	_	FROM - T		4	ELEV.	-	and the second second	5% And . 3	_			
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DUANTITI	53.	13	L.F. 501	1 7.5 1	r. R	OCK 7	33	SAMPLES		US TUBE	3   -	L.F. OW I	PIPE

			8-11-1	History and			MAN HIS					
DATE ST	ARTED	5.5	-86		ede	rasso	ciales		/ SHEE	T OF	1	
DATE FIL	NISHED:	5-5			BOF	RING RE	PORT		BORI	NG NO.	SB 12	
CLIENT		A STATE OF THE PARTY OF THE PAR		CAL CORPOR	-		EL ARRIVE		Star III			
	NAME AN			TE INVESTIG		FOR A	DIENTENT	9/ (04	TRAINE	7/04/		
The state of the last of the l	'NO. (S)		5 01	10 1/4 463/14	771701	,	011/0/11	1 4	7774777	77.074		
	CONTRACTO			GEOTECHNIC	.0.		BORING	FOREMAN	1 . hul	DINGLE	S D/I/S	
	NGINEER	-		DEIANAS	172		INSPEC		ICK RE	The second secon	DINC	
					SAMPLER		CORE			LL (OW)	DRILLING	RIG
EQUIPME	MTI	CAS	ING	SPLIT SPOON (SS		BED (US)	BARREL	AUGER	PIPE	CAP	AND MET	нор
TYPE		=		CARBON STEEL				HSA	_	-	CME 5	_
SIZE :		_		2" 00	-		_	6	-	~		
	WT/ FALL			140/30	-			BIT.			Mobile C	De: 11
	ELEVATIO	M:		NORTH COOR	DINATE		410		T COORDINA	TEI		
	CONDITIO		PAVEL	LEVEL	Control of the Contro							
	NATER AT			EOB HRS.	FT. AF	TER	HRS.			Bellin		
DEPTH	CASING	-			STRAT	A   0	ESCRIPTION	AND REMA	RKS		-11	
BELOW	BLOWS	TYPE	DEPTH	BLOWS /6" OR	DEPTH	/ 1	rece = 0-10	% Little =	10-20%		nitor Well	
GND.	PER FT.	a NO.	FROM - 1		ELEV.	3	ome = 20-	35% And :	35-50%	Co	nstruction	1
0		5 99						ILT WE	-	FILL		
	3	1	7.0	7 5 1	1					1-1-1		
	C	5 100	1.5 - 3		325 (30% C)	550 BRN,	14m ch	AY + 31	LT SOME	Philips .		
	- 3	31,00	100	5 9	4		SAHO			Line of		
5	5	SIDI	3-4.5			BEN	4W/68	Y Mottle	d clay	TILL	PER STATE	
		3101	0 7.			4	SILT 4	2 gravel		11111		
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				-	5 11 16							
	5	\$ 102	7.5-0	3 Sa 20% 6564	45% C1 359	6 60	CLAV	little s	1++			
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Tune	1	805111		CARINO		-	FTTHE	M	CASING		70	
QUANTIT	A	BORING	L.F. 50	CASING	F. ROCK	8 s:	SAMPLES		US TUBE		TO -	FT.
QUANTIT		13	L.F. 50	11 11 1.1	r. HUCK	D 5:	JAMPLE!	·	03 1088	3 -	L.F. OW PIPE	

	RTED		9/86		1 eder	asso	ciales		/ SHEE		/
DATE FIN	SHED		1291	NAME AND ADDRESS OF THE OWNER, WHEN PERSON ADDRESS OF THE OWNER, WHEN PERSON AND ADDRESS OF THE OWNER, WHEN	BORI	NG RE	PORT		BORI	NG NO. S	B-13A
CLIENT :				LL CHEM	ICAL	CORP					
	NAME AND	LOCATI		POTE NITIAL				INVES	716-AT	ION	
PROJECT	NO. (S):		195-	1							
ING C	ONTRACTO	R: TA	21665	GEOTECHI	VICAL	1.0	BORING	FOREMAN	JOHN	DINGL	EDINE
EN	GINEER:	NIC	K AR	DRIANAS			INSPEC	TOR: N	ICK BEC	CHIA	
EQUIPMEN	7.		140	SOIL S			CORE	AUGER	085. WE	LL (OW)	DRILLING RIC
EQUIPMEN		-		SPLIT SPOON (SS)	UNDISTURB	ED (US)	BARREL		PIPE	CAP	AND METHOD
TYPE		-		STEEL				HSA	-	_	CME 55
SIZE :		_		2"00	-			6"	-	_	Mobile DRIL
HAMMER W	T/ FALL	-		190/2"	_			BIT.			LIODILE DEIL
SURFACE	ELEVATION	4:		NORTH COORD	INATE:			EAS	T COORDINA	TE	
SURFACE	COMDITION	131	LEVE	L-DZY-6	RASS						
GROUNDW	ATER AT	7.5 F	T. AFTER	25 HRS.	FT. AFT	R	HRS.				
DEPTH	CASING				STRATA	DE	SCRIPTION	AND REMA	RKS	Mo	nitor Well
BELOW	BLOWS	TYPE	DEPTH	BLOWS /6" OR	DEPTH/	Tr	ace = 0-10	% Little =	10-20%		nstruction
GND.	PER FT.	a NO.	FROM - T	O CORE TIME	ELEV.	30	me = 20 - 3	5% And . :	55-50%	Col	istruction
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			7 5 6 1	5 6		1		CT + CL	AY	The same	
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5		5531	3-4.5	-	1	SAM	E (71	LL)			
						1				TILL	
		5532	7.5-9	12		RdI	BEN CI	AY lit	410		
				10 17		1.0,0			f/gravel		
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		13.7.4	- 1111		The state of		we	athered		SHA	3.
.15			Bak III								
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			a kale							The said	
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	E 192	1			A THE	The same					
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TYPE	A	BORING	-	CASING ~	- 10		FT THE	_	CASING	1	10 F
	ES:	24.5					SAMPLES		US TUBE		L.F. OW PIPE

ATE STA			4-86		eder	assoc	iales		/ SHEE		1	
ATE FIN			4.86		THE RESERVE OF THE PERSON NAMED IN	NG REP	ORT		BORI	NG NO.	B 1919	,
LIENT .				CORPORATIO								
				raditeduni 3	10N FOR	2 POTE	MIAL	CONTAI	101TA UIN	<u> </u>		
	NO. (8)-	THE RESERVE TO A PERSON NAMED IN COLUMN 1	501									
				GEOTECHNICE	16			FOREMAN	0-111	J DINGE	EDINE 34103.	
EN	GIMEER !	DICK	ALD				INSPEC	TOR: L	YCK RE			
EQUIPMEN	IT:	CAS	ING		AMPLER		CORE	AUGER		LL (OW)	ORILLI	
				SPLIT SPOON (SS)	UNDISTURBE	ED (US)	BARREL		PIPE	CAP	AND M	-
TYPE		_		CARBON STEEL	_		_	HSA	-	_	CME	55
SIZE		_		2"00	_		-	6	-	-	Mobile	DRI
HAMMER W	T/ FALL	-		140/30				BIT.				
	ELEVATION			NORTH COORD	INATE:			EAS	T COORDINA	TEI		
				IEL GRASS								
	ATER AT	7.5 F	T. AFTER	EOB HRS. 10		R 18						
DEPTH	CASING				STRATA			AND REMA	A STATE OF THE PARTY OF THE PAR	Moi	nitor We	11
BELOW	BLOWS	TYPE	DEPTH	BLOWS /6" OR	DEPTH/	- Carlotte - Francisco - Carlotte		% Little =	A STATE OF THE PARTY OF THE PAR	Cor	struction	on
GND.	PER FT.		FROM - T	-	ELEV.	Son	ne = 20-1	55% And .	35-50%			
0	SS	37	0-1.5			RAIRE	N/RIK	SILTY	SAND	FILL		
				6 5	1	1	4	SILTY		'		
	SS	38	1.5-3		3	SAME						
	S TO A SE			5 8		121/8	en CL	AY litt	le silt	TILL		
5	SS	39	3-4.5	11		100	4 501	d te. g.	PAYEL			
								9		The same		
						60				100		
	SS	40	7.5-9			SAME				Little .		
	di T			12 20		1						
10						Take .				1 100		
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	SS	41	12 -13	45 100	12	+	-255 /					
	N. S. 111				1 4		A STATE OF THE STA	DEATHER	10	SHALE		
						6	she has	374		1		
15	SS	42	16-16:	100/.5		SAME						
		-		_							W. 7.77	
		-				1				173		
		-			19.5	The Thirty						
1		100	100	20 / -	19.5	80.10						
20	3	43	195-	20 70/.5	10 TO	SAME						
	3429					EOB	@ 20			1 22 3		
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										A STATE		
		-	THE R									
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	NT PER	100		Transaction in						A Service		
	Marie S. Co.				THE PARTY							
	The state of the s				The state of the s							
TYPE		BORING		CASING	_ TO		FTTHE	ALCOHOL:	CASING		TO -	

DATE ST	ARTED .	9/29	1/86		eder	asso	ciates		/ SHEE	T OF	1
DATE FIR		Sandard Million and State	124/86	Ź		NG RE		She E	BORI	NG NO.	18 15
CLIENT :		Bar Sala		KILL CHEN	11CAL	CORP					
PROJECT	NAME AND	LOCAT		TENTIAL COL				CSTIGA	TION	BEAFE	2D 0410
-	NO. (5):		995-			N. Phil	- UTVA				
UNG C	CONTRACTO	RI TH	and the same of th	GEDTECHN	ICAL		BORING	FOREMAN	NAMA !	DINKLE	DINE
	NGINEER:			DEIANAS			INSPEC		IICK RE		
				SOIL S	AMPLER	10000	CORE			LL (OW)	DRILLING RIG
EQUIPME	NT:	CAS	ING	SPLIT SPOON (SS)	UNDISTURBE	D (US)	BARREL	AUGER	PIPE	CAP	AND METHOD
TYPE			-	Steel			-	HSA	-	-	CME 55
SIZE	2047	_		2"00	-	As a		6"1	-	- 1	MIL'I DE
HAMMER Y	WT/ FALL	_		140/30"				BIT.			Mobile Drill
SURFACE	ELEVATIO	N:		NORTH COORD	NATE:			EAS	T COORDINA	TE	
SURFACE	CONDITION	NS: C	EVEL	PZY GR	A55						
GROUNDW	VATER AT				FT. AFTE	R	HRS.	Contraction of			
DEPTH	CASING	16.15.7			STRATA	DI	SCRIPTION	AND REMA	RKS	Mor	nitor Well
BELOW	BLOWS	TYPE	DEPTH	BLOWS /6" OR	DEPTH/	Tı	ace = 0-10	% Little =	10-20%	Laborator and the second	
GND.	PER FT.	a NO	FROM - T	O CORE TIME	ELEV.	30	me = 20-3	5% And =	35-50%	Cor	struction
0		55/6	0-1.5	2 3		70950	11 411				
	A COLOR			167				VOY SILT	1:41-	E	LL
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		MAL	A STATE OF	16 9				DRANIC	5	1	
5		SSIA	3 - 4.5	12		SA	ME			1	
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	The same	5519	7.5-9	7		BEL	SILT	4CTUA		TIL	-L
				7 8			tR 51	c save	3		
10							7				
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	Maria	5520	12-12.5	67/-5		Nie	hly us	eathered	1	. 4	
Sign-4						1	1	A A A	11-1		
						1	0-KY 5	SHALE !	(Ry)	The same of the same	
15		5521	15.5-16.5	110/.5		SA	ME				
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						7	,	. , 11			20 21
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S S M S				The state of the			WEA	thered	MORE	100	
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		D294	26-26.	2001-5	M. J. St.	SAM	36 ( de	4)			
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		05:0	-		By B	000		1			
30		5525	29.5-39	200/.4		SHE	it (di	(٢)			
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		-			THE I	194	Bell J	1- (			
The New		5526	33-33.	3 200/-3	1	SAN	48 (0	(Py)		- Part	
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35		6-0-	124.2	8 00 / 2				, ,			
		552	136-36-	2 200/.2	11 11 11	SA	ME (	(11)		1	
		-	-		A CO	1				Bar I S	
		-	-			1			,	Bar Net	
40		5(20	20 5 3	97 200/2		15	ORA	40	1		
TYPE	A	BORING		9.7 200/.2 CASING -	то	1-	FT THEN		CASING		10 =
QUANTITI	ES:	40	L.F. SOIL			2 55	SAMPLES		US TUBE	-	TO - FT.
		70	C.r. 3011	U L.F.	/	2 33	JAMPLES.		03 1085	,   _	L.F. OW PIPE

DATE ST	ARTED :	4/2	5/8	6		eder	assoc	ciales		/ SHEE		
DATE FIN	NISHED:	'	14/	25/86	,	BORIN	IG REF	PORT		BORI	NG NO.	S.BW 16
CLIENT :	HL	KILL	CHE	MCC	ORP.				and the state of			
PROJECT	NAME AN			POTEN		CONTA	MINA	TION	INVES	TIGATIO	N : 30	EDFORD, OHIO
PROJECT	NO. (S):		49:	5-1			MALE.					
AGRING (	CONTRACTO	OR . T	21665	6-8078	CHNICH	14		BORING	FOREMAN	· JOHN	DING	SAIGS
EN	NGINEER			DRIAN				INSPEC	TOR: N	ICK RE	CCHIA	
PME					SOIL SAN	PLER		CORE			LL (OW)	DRILLING RIG
ESSIPME	NT:	CA	SING	SPLIT SPOC	N (33) U	NDISTURBE	0 (03)	BARREL	AUGER	PIPE	CAP	AND METHOD
TYPE				steel	and the second second			- 197	HSA		_	CME 55
SIZE :	- 1			2" 00	C. S. C.	_		-	6 *	-	_	
HAMMER V	WT/ FALL			190/3	-	7 11			BIT.		- 100	Mobile Deill
SURFACE	ELEVATIO	N:		THE REAL PROPERTY.	COORDIN	ATE:			EAS	T COORDINA	TEI	
	CONDITIO		15116	L DE	_		2012					
	ATER AT			24 HR		FT. AFTE	,	HRS.				
DEPTH	CASING	1		07		STRATA			AND REMA	RKS		
BELOW	BLOWS	TYPE	DEPTH	BLOWS	/6" DP	DEPTH/			% Little =			nitor Well
GND.	PER FT.	a NO.	A CONTRACTOR		TIME	ELEV.	A SHELL OF THE REAL PROPERTY.		55% And .		Cor	nstruction
0	PER FI.		0-1.5		-				SAND		FIL	,
		2377	0-1.5	ACCOUNTY OF THE PARTY OF THE PA	4			/		The second secon	FIL	_
		50.46	15 2	7	6		Charles Townson	/	, brick			
		DS 43	1.5-3	9	14		BIR	SAND	, little	silt		
		6041	2 1 1	6	4		CIP	ler show	ىر		1	711
5		5396	3-4-5	1 5a7	15% S135%	16140%	REUN	11.1 510	LT SIME	clay	1	- TILL
4					12		4	5/50	Nd + gen	-1		
		60.50	- 0	-		che is				001		
		5547	7.5 - 9	20	24005	6 5:45% CI	SAH	E (T	144)		13 1 - 3	
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							11.	11	1440001	CPU	-	
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		5549	16-16	5 1701	-5		SAL	1E Ch	19hly 48	(Achred)		
							1000			,		
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20	STORES.	5550	19-19.	5 270	1.5		SAM	E ( Mi	oist sea	m 6)	(-	WET SEEP
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	AUGER		700	400/	- 5							
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	17. Jan. 1			A A A		1					THE REAL PROPERTY.	
	T No.					1					<b>美国</b>	
			-			1	The state of					
						1	les in					
TYPE	A	BORING	3 -	CASII	NG -	- TO		FT THEN	-	CASING	-	TO FT.
QUANTITI	-	25	L.F. 501		L.F. R		7 55	SAMPLES		US TUBE	5	
							-175.01					L.F. OW PIPE O

	that en					Constitution to				700 × 40		
DATE STA	RTED		- 86		eder	associate	25		/ SHEE		1	
DATE FIN			- 86		THE RESERVE THE PERSON NAMED IN	NG REPORT			BORI	NG NO.	SB 1	7
CLIENT :	HUK	ILL (	CHEMIC	AL CORPOR	ATION							
_	NAME AN			ITE INVESTI		FOR POTE	1174	9L (0)	NIMATO	ATION		
_	NO. (S):		501		There							
	ONTRACTO	R: 7	PRIGGS	GEOTECHN	MICAL	_	-	FOREMAN	1 70HD	DINGL		
SONS EN	GINEER .	NU	KAPI	PIANAS		INS	PECT	OR .	NICK	AND DESCRIPTION OF THE PERSON NAMED IN	The Party of the P	
EQUIPMEN	uT:	CAS	ING	SOIL SA		CORE		AUGER	OBS. WE	LL (OW)	DRII	LING RIC
				SPLIT SPOON (SS)	UNDISTURBE	O (US) BARRE	-		PIPE	CAP		METHOD
TYPE :		1		CARBON STEEL				# SA		_	CME	55
SIZE :	100	_	-	2"00		_		6	_	_	Mobile	Dail
HAMMER W	T/ FALL	-	- 750	140/30	_			BIT.			Licons	DKIL
	ELEVATIO			NORTH COORDI					T COORDINA	TE		
SURFACE	CONDITIO			slight grade	toward	ls east	, D	EA				
	ATER AT	17 1	T. AFTER	11/2 HRS.	FT. AFTE							
DEPTH	CASING	-			STRATA		-Villa	AND REMA		Mo	nitor W	lell
BELOW	BLOWS	TYPE	DEPTH	BLOWS /6" OR	DEPTH/	THE RESERVE OF THE PARTY OF THE		% Little =			struct	
GND.	PER FT.	8 NO.	FROM - T		ELEV.		-	5% And = 3	the later with the la	COI	.ser det	1011
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-										A STATE OF THE STA		
	S	3108	1.5-3	3 45a4on 75i3en 5 8	6 C1 330%	R1/200	10	V 1:44	0 5:11	100 F 120		
				5 8		10/0th	61	ווווון ו	E 2111	TILL		
5	SS	109	3-4.5		59. C1 35%	SAME TE	4/0	gravel		TILL		
						SIFIC				1 20 7		
		- Feet		`		Property of				F B R		
	S	5110	7.5-F	\$ 5a 869 Si40	no C (45%	SOME						
10		1		15 24		SHITE						
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1000	3	- 111	10.	50	1.5	FRACTURE	0/4	DEATHER	ED 03	SHALE		
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TYPE	_	BORING	-	CASING	TO	FT THE	N -	CASING	_	TO	F		
_		6'	L.F. 301			SS SAMPLES			15 -		-		

DATE STARTED : 9-25-86 eder associates SHEET / OF BORING REPORT BORING NO. 58 28 DATE FINISHED . 9-25-86 COPP CHEMICAL PROJECT NAME AND LOCATION SUBSURFACE INVESTIGATION Phase II PROJECT NO. (S) 49501 JOHN DINGLEDINE RING CONTRACTOR TRIGGS GEOTECHNICAL BORING FOREMAN: LS ENGINEER INSPECTOR . NICK RECCHIA SOIL SAMPLER 083. WELL (OW) DRILLING RIG CORE EQUIPMENT: AUGER CASING SPLIT SPOOM (SS) UNDISTURBED (US BARREL PIPE CAP AND METHOD TYPE : STANDARD HSA CME 55 4" ID SIZE . 2"00 Mobile DR HAMMER WT/ FALL 140/30 BIT. NORTH COORDINATE: EAST COORDINATE: SURFACE ELEVATION: SURFACE CONDITIONS FT. AFTER GROUNDWATER AT FT. AFTER HRS. HRS. DESCRIPTION AND REMARKS DEPTH STRATA Monitor Well OVA TYPE Trace = 0-10% Little = 10-20% DEPTH BLOWS /6" OR DEPTH/ BELOW READING Construction Some . 20-35% And . 35-50% a NO. FROM - TO CORE TIME ELEV. Rd /BRN /BLK ASH, BRICK .5-2 11 SAND, GLASS, FULLNORY 55106 2-3.5 3 4 3.5 SLAG + SAND RY SAND FILL some gravel 5 brick powder FILL to 15.5 1.5 55107 8-9-5 2 SAME SHALE to EOB 10 SAME ASh + cityles 55108 12.5-14 3 4 6 15 15.5 RO/BRN HIGHLY WEATHERED 19 19 55/09/17-18.5 SHALE 30 20 SS110 23.5-24. 60 GRY weathered shale 100/.3 25 E08@ 24.3' CASING FT THEN TYPE BORING TO CASING TO FT. 15.5 QUANTITIES! SS SAMPLES L.F. SOIL 8. 8 L.F. ROCK US TUBES L.F. OW PIPE

DATE STARTED SHEET 9-24-86 / OF eder associates BORING REPORT BORING NO. 5829 DATE FINISHED 9-24-86 HUKILL CHEMICAL CORP. Bedford PhASE II PROJECT NAME AND LOCATION SUBSURFACE INVESTIGATION 49501 PROJECT NO. (S): JOHN DINGLEDINE RING CONTRACTOR : BORING FOREMAN . TRIGGS GEOTECHNICAL NICK RECCHIA ILS ENGINEER INSPECTOR : DRILLING RIG SOIL SAMPLER OBS. WELL (OW) CORE EQUIPMENT: CASING AUGER SPLIT SPOON (SS) UNDISTURBED (US BARREL PIPE CAP AND METHOD CME 55 STANCARD MSA TYPE : 2"00 4"50 SIZE Mobile DRill HAMMER WT/ FALL 140/30 BIT. NORTH COORDINATE EAST COORDINATE SURFACE ELEVATION: MA SURFACE CONDITIONS FT. AFTER 1/6 FT. AFTER GROUNDWATER AT STRATA DESCRIPTION AND REMARKS DEPTH Monitor Well OVA Trace = 0-10% Little = 10-20% BELOW DEPTH BLOWS /6" OR DEPTH/ READING Construction FROM - TO GND. CORE TIME ELEV. Some . 20-35% And . 35-50% A NO .5-2 5583 BLK/BRN SAND, ASH, BRICK FILL to 4.5 48 GLASS + GRAVEL 31 5584 2-3.5 55 FOUNDRY SLAG 9 4.5 5 55 85 3.5-5 TILL to 9.5 BEN CLAY TILL Shale to EOB 8.5 55868-9-5 11 14 9.5 Rd/GRY 10 21 Highly weathered shake wet seam @ 23.5' 12.5 water level to 12.5' V after 10 min 25 15 5587 14.5-16 4.4 SAME 75 106 20 67 15 5588 21.5-225 SAME . 161 5589 22-5-235 87/.5 GRY SHALE WET SEAM 25 EOB @ 23.5 TYPE BORING CASING FT THEN TO FT. QUANTITIES: 9.5 L.F. SOIL 7 SS SAMPLES US TUBES 14 L.F. ROCK L.F. OW PIPE

DATE STARTED eder associates BORING REPORT 9-26-86 SHEET BORING NO. DATE FINISHED : 9-26-86 8 30 CORP HUKILL CHEMICAL PROJECT NAME AND LOCATION SURSURFACE INVESTIGATION BEDFORD 0410 49501 REDJECT NO. (S): BORING FOREMAN : RING CONTRACTOR : JOHN DINGLEDINE TRIGGS GEOTECHNICAL ILS ENGINEER INSPECTOR : NICK RECCHIA OBS. WELL (OW) DRILLING RIG SOIL SAMPLER CORE EQUIPMENT: AUGER CASING SPLIT SPOON (SS) UNDISTURBED (US) BARREL PIPE CAP AND METHOD STANCARD CME 55 TYPE : H5A 2"00 1"ID SIZE : Mobile Deill 140/30 BIT. HAMMER WT/ FALL NORTH COORDINATE EAST COORDINATE SURFACE ELEVATION: KA. SURFACE CONDITIONS : FT. AFTER FT. AFTER HRS. GROUNDWATER AT HRS. DESCRIPTION AND REMARKS STRATA DEPTH Monitor Well OVA DEPTH BLOWS /6" OR DEPTH/ Trace = 0-10% Little = 10-20% BELOW TYPE READING Construction Some = 20-35% And = 35-50% GND. FROM - TO CORE TIME ELEV. BLK/BRN SAND, ASH, BRICK 1.5 SSIIIA .5-2 0 founder slag + geavel FILL +6 21.5 2-3.5 IIIB 4 4 5 5 3 111C 3.5-5 4.8 TILL to 26' SAME MOSTLY Slag MATERIAL 1110 8-9.5 340 25 SHALE 40 EOB 10 12 111E 12.5-14 SAME 3 15 10 IIIF 17-18.5 6 SAME 20 21.5 5 1116215-23 BRA/GRY CLAY TILL 10 25 26 111 H 28-28.5 150/.5 GRY WEATHERED SHALE 30 €03 € 28.5 BORING FT THEN CASING FT. CASING TO TO QUANTITIES: 26 2. 5 L.F. ROCK SS SAMPLES L.F. SOIL US TUBES L.F. OW PIPE

DATE STARTED 9-26-86 eder associates BORING REPORT SHEET BORING NO. 58 31 DATE FINISHED 9-26-86 CLIENT: HUKILL CHEMICAL COPP. PROJECT NAME AND LOCATION SUBSURFACE INVESTIGATION 49501 PROJECT NO. (S) BORING FOREMAN : ING CONTRACTOR TRIGGS GEOTECHNICAL 3410379AID CHOC LS ENGINEER : INSPECTOR : NICK RECCHIA SOIL SAMPLER DRILLING RIG CORE OBS. WELL (OW) EQUIPMENT: CASING AUGER SPLIT SPOON (SS) UNDISTURBED (US) BARREL PIPE CAP AND METHOD TYPE : STANDARD HSA CME 55 SIZE 2"00 4"ID Mobile Dzil HAMMER WT/ FALL 140 /30 BIT. SURFACE ELEVATION: NORTH COORDINATE EAST COORDINATE: SURFACE CONDITIONS: NW FILL AREA GROUNDWATER AT FT. AFTER HRS. FT. AFTER HRS. DEPTH STRATA DESCRIPTION AND REMARKS OVA Monitor Well Trace = 0-10% Little = 10-20% BELOW DEPTH BLOWS /6" OR DEPTH/ READING Construction GND. a NO FROM - TO CORE TIME ELEV. Some . 20-35% And : 35-50% 0 SS113A .5-2 BEN SAND, WOOD + 3 foundry stag/sand 1138 2-3.5 10 4 FILL to 27' 8 SAME 20 113C 3.5-5 29 Shale to EOB 4 11308-9.5 4 2 BRN SAND + FOUNDRY Slag 10 tr gravel SAMe 12 113E 12.5-14.5 15 GRY/Rd SAND well socked 2 113F 17.5-19 20 600 1136-22.5-23.5 2 BLK FOUNDRY SAND some slag 27 1134 26.5-28 GRY WEATHERED Shale 100 2 16 100 30 EDB@ 28' TYPE BORING CASING TO FT THEN CASING TO FT. QUANTITIES: 27 L.F. 301L L.F. ROCK 8 SS SAMPLES US TUBES

DATE STARTED: 9-25-86  CLIENT: HUKILL CHEMICAL CORP						eder a	IG RE	PORT		BORING NO. 58 32				
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